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EPA Superfund
Record of Decision:

FEDERAL CREOSOTE
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MANVILLE, NJ
09/28/1999

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DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Federal Creosote Superfund Site
Borough of Manville, Somerset County, New Jersey

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) documents the U.S. Environmental Protection Agency's selection of an early interim remedial action to address source material at the Federal Creosote site, in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA) [42 U.S.C. §9601-9675], and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan, as amended, 40 CFR Part 300. This decision document explains the factual and legal basis for selecting the remedy for the first operable unit of the site.

The New Jersey Department of Environmental Protection (NJDEP) has been consulted on the planned remedial action in accordance with CERCLA §121(f) [42 U.S.C. §9621(f)]. The information supporting this remedial action is contained in the Administrative Record for the site.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the Federal Creosote site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The remedial action described in this document addresses the principal threats posed by the Federal Creosote site. It involves the remediation of buried lagoons and canals that are considered source areas of creosote contamination in a residential development. Additional remedial actions are planned to address residual soil contamination and contaminated groundwater.

The selected remedy for the site, which is an early interim action, includes:

- Permanent relocation of residents from certain properties within the canal and lagoon source areas, and temporary relocation where necessary to implement the remedy;

- Excavation of source material from the canal and lagoon source areas, backfilling with clean fill, and property restoration as necessary; and

- Transportation of the source material for off-site thermal treatment and disposal.

DECLARATION OF STATUTORY DETERMINATIONS

This interim action is protective of human health and the environment for a portion of the site, and is intended to provide an early response to the principal threats before the final ROD is signed for the site. This action complies with those federal or state requirements that are applicable or relevant and appropriate for this limited scope action, and is cost-effective. Although this interim action is not intended to address the site fully, the statutory mandate for permanence and treatment was met to the maximum extent practicable. In addition, this interim action utilizes treatment as a principal element of the remedy, and thus supports that statutory mandate. Because this action does not constitute the final remedy for this site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed by this remedy, will also be addressed further by additional response actions. Subsequent actions are planned to address fully the threats posed by conditions at this site.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an interim action ROD, review of the site and remedy will be ongoing as EPA continues to develop remedial alternatives for the site.

William J. Muszynski
Jeanne M. Fox
Regional Administrator

9/28/98
Date

RECORD OF DECISION

DECISION SUMMARY

Federal Creosote Site

Borough of Manville, Somerset County, New Jersey

United States Environmental Protection Agency
Region II
New York, New York
September 1999

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SITE NAME LOCATION AND DESCRIPTION

The site is located in the Borough of Manville, Somerset County, New Jersey (see Figure 1 in Appendix I), and is currently an active residential community of single-family homes on approximately 35 acres.

The site is located within the Raritan River watershed system. The Raritan River is located approximately 2,000 feet north and east of the site and the Millstone River is located approximately 1,200 feet to the southeast. It is situated on a topographic high that is nearly equidistant from the Raritan and Millstone Rivers and approximately a mile west (upstream) of their confluence. The site is bordered to the west by a variety of commercial uses, including the Rustic Mall. To the north, on the opposite side of the Norfolk Southern railroad tracks, is the former Johns-Manville property. The Johns-Manville company property has been redeveloped for a variety of commercial and retail uses, including automobile storage, warehousing, and large retail stores. To the south, on the opposite side of the CSX tracks, the area is primarily residential.

SITE HISTORY

The site was the location of a wood treatment operation beginning in approximately 1910. During the operations untreated railroad ties were delivered to the site by rail and were processed in a treatment plant located on the western portion of the property. Coal tar creosote was applied to the railroad ties in this area of the property. Treatment residuals from the plant were discharged into two unlined canals. One canal directed the flow of the treatment residuals to the northern portion of the property for a distance of approximately 375 feet where the canal contents entered an unlined lagoon. The other canal directed the flow of treatment residuals toward the southern portion of the property, where the contents of this canal spilled into another unlined lagoon located approximately 1,500 feet from the treatment plant. After treatment, the railroad ties were moved from the plant to the central portion of the property where the excess creosote dripped from the treated wood onto the ground.

Land use patterns on the Federal Creosoting Company property remained the same until the mid-1950s when the wood treatment plant ceased operations and was dismantled. During the late 1950s and early 1960s, the area that formerly housed the treatment plant was developed into a 15-acre commercial and retail property known as the Rustic Mall. Through the early to mid-1960s, 35 acres of the former Federal Creosoting Company property, including the drip area, canals and lagoons, were developed into the Claremont Development which is made up of 137 single-family homes.

In April 1996, NJDEP responded to an incident involving the discharge of an unknown liquid from a sump located at one of the Claremont Development residences on Valerie Drive. A thick, tarry substance was observed flowing from the sump to the street. In January 1997, the Borough of Manville responded to a complaint that a sinkhole had developed around a sewer pipe in the Claremont Development along East Camplain Road. Excavation of the soil around the pipe identified a black tar-like material in the soil. Subsequent investigations of these areas revealed elevated levels of contaminants consistent with creosote.

Following the discovery of this material, NJDEP, with technical assistance from EPA, began an investigation of the site. In April and May 1997, air samples were collected inside the majority of homes in the Claremont Development. With the exception of one house, the analysis of these samples indicated that the site-related contaminants were not present in the homes at elevated levels.

In October 1997, EPA's Environmental Response Team (ERT) initiated a site investigation limited to properties believed to contain creosote contamination based on analysis of historical aerial photographs as well as input from residents. This investigation included the collection of surface and subsurface soil samples at select locations within the residential development. Over 100 surface and subsurface soil samples were collected. These sampling results, contained in the November 1998 report entitled “Technical Memorandum - Site Investigation Report”, indicated that the canals and lagoons still exist beneath the Claremont Development. The result of this investigation indicate that the contamination is extensive, is uncontrolled, and has impacted sediment, soil and groundwater in the area.

In January 1998, responsibility for the site was transferred from NJDEP to EPA.

From February through April 1998, ERT collected over 1,350 surface soil samples on 133 properties in and adjacent to the Claremont Development in order to determine if an immediate health risk existed. The results of the surface soil sample analyses, which were made available to each individual property owner, were reported in the “Interim Surface Soils Human Health Risk Assessment”, dated January 19, 1999. EPA identified 19 properties with surface soil in yards containing elevated levels of creosote related contaminants. While the levels were elevated, a risk assessment showed that they did not pose a short-term (acute) risk to residents. However, the risk assessment did show that the levels exceed EPA's acceptable risk range for carcinogens and pose a long-term risk. Therefore, EPA applied topsoil, mulch, seed and sod on properties that contained elevated levels of creosote in surface soils, to limit the potential for exposure. In addition, EPA installed an odor control system in the basement of one property and installed a storm water drainage system on one property.

In February 1999, the Agency for Toxic Substances and Disease Registry (ATSDR) completed a health consultation that assessed the public health impact from direct contact with the surface soils. ATSDR concluded that the surface soil concentrations of lead, arsenic and PAHs do not pose a public health hazard.

The groundwater beneath the site is classified by NJDEP as IIA, potable water. It is currently a source for the public water supply and, based upon NJDEP classification is expected to provide drinking water in the future. As part of its site investigation, ERT installed 17 groundwater monitoring wells to begin the investigation into the extent of groundwater contamination. The public water supplies and monitoring wells installed in and around the site were sampled for any site-related contamination in March and April 1998 by ERT. The results of this sampling indicated that the public water supplies are not currently being affected by contamination from the site. However, the results of the groundwater sampling from monitoring wells located on the site do indicate that the groundwater is contaminated with components of creosote. A comprehensive groundwater investigation is being conducted to complete the characterization of the groundwater conditions in the area surrounding the site.

In November 1998, EPA initiated a remedial investigation and feasibility study (RI/FS) to more fully characterize the nature and extent of contamination at the site. Subsurface soil sampling started in December 1998 and was completed in March 1999. Over 230 borings were installed, and approximately 2,000 soil samples have been collected for analysis. In contrast to ERT's investigation, which focused on the lagoon and canal areas, this investigation will characterize deep soils throughout the entire Claremont Development. In addition, the results of this sampling will provide more accurate data concerning the lateral and vertical extent of the lagoon and canal source areas.

In March 1999, as part of the RI, a more extensive groundwater investigation was initiated to characterize the vertical and lateral extent of groundwater contamination caused by the site. Approximately 30 additional monitoring wells will be installed and tested in areas surrounding the development. Several of the subsurface boring holes from the soil investigation have been converted into shallow monitoring wells that, when sampled, will provide information on the quality of shallow groundwater at the site. In addition, sediment samples in the Millstone River and Raritan River will be taken as part of the RI to determine if the site has impacted the river.

Completion of the field work for this broader site investigation is expected in the fall of 1999. Following these investigations EPA will evaluate what other remedies may be necessary to address the site.

The site was proposed for the National Priorities List (NPL) on July 27, 1998, and was formally placed on the NPL on January 19, 1999.

The data from the 1997/1998 investigation conducted by ERT indicate that the canal and lagoon areas are the major sources of soil and groundwater contamination in the Claremont Development. EPA then prepared an Engineering Evaluation/Cost Analysis (EE/CA) to evaluate remediation options for only the lagoon and canal source materials. This EE/CA was completed in April 1999.

ENFORCEMENT ACTIVITIES

EPA has identified Federal Creosoting Company, and Kerr-McGee Corporation as potentially responsible parties (PRPs). EPA sent a general notice letter to one PRP for this site, Kerr McGee Corporation.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Proposed Plan and supporting documentation for the cleanup of the lagoon and canals were released to the public for comment on April 30, 1999. These documents were made available to the public at the EPA Administrative Record File Room, Room, 290 Broadway, 18th Floor, New York, New York; and at the Manville Public Library, 100 South l0th Avenue, Manville, New Jersey 08835.

On April 30, 1999, EPA issued a notice in the Courier-News newspaper which contained information relevant to the public comment period for the site, including the duration of the comment period, the date of the public meeting and availability of the administrative record. The public comment period began on April 30, 1999, and was scheduled to end on June 1, 1999. Due to a request, the comment period was extended until June 25, 1999. A public meeting was held on May 12, 1999, at the Weston Elementary School located on Newark Avenue, Manville, New Jersey. The purpose of this meeting was to inform local officials and interested citizens about the Superfund process, to discuss the Proposed Plan and receive comments on the Proposed Plan, and to respond to questions from area residents and other interested parties. Responses to the comments received at the public meeting and in writing during the public comment period are included in the Responsiveness Summary (see Appendix V).

SCOPE AND ROLE OF RESPONSE ACTION

The remedial action described herein addresses the principal threats associated with the Federal Creosote site. The source material found in the canals and lagoons is a principal threat waste in that it is considered to be toxic and mobile, cannot be reliably contained, and presents a significant risk to human health or the environment should exposure occur. This remedial action pertains to the first phase, or Operable Unit, at the site and is considered to be an early interim action that only addresses the cleanup of the highly contaminated source areas: the lagoons and canals. Based on the information EPA has obtained to date, 10 houses are located either directly over or immediately adjacent to the lagoons. In addition, the canals and a trench exiting one of the lagoons have been found on 22 other properties within the Claremont Development. Portions of the canals appear to lie underneath houses on some of the 22 properties.

The scope of this Operable Unit is estimated to include 32 residential properties: 10 properties associated with the lagoons; and 22 properties associated with the canals and the Lagoon A exit trench. To the extent that the lagoons and canals extend beneath public roads within the Claremont Development, those roads would also be included in the Operable Unit.

EPA plans to initiate this remedial action in order to address the principal threat waste by initiating a remedy for the source areas as early as possible. As described below, EPA's action will require the permanent relocation of residents from an estimated 10 to 19 properties, so that the houses can be demolished to excavate the contaminant source areas. (The exact number of permanent relocations needed to address the source areas will be determined after the ongoing subsurface investigations described above are completed.) Other residents may also require temporary relocation during the work of addressing the source areas. Because the permanent relocation and temporary relocation processes can be time-consuming, this early interim action serves to initiate the relocation process as early as possible. Until the permanent relocations are complete, EPA will not begin any excavation activities.

This ROD does not address any potential contamination on other residential properties within the Claremont Development, within the Rustic Mall, or in the groundwater. This early interim action will be consistent with the final remedy for the site, and as such, will not preclude the implementation of the final remedy. Any contamination from the Federal Creosote site found in these areas may be the subject of future actions. The results of EPA's investigations of the other 105 residential properties in the Claremont Development were made available to the residents of the Claremont Development in August 1999. EPA expects to issue a Proposed Plan to address those properties in the fall of 1999.

SUMMARY OF SITE CHARACTERISTICS

Preliminary determinations of the locations of the canals and lagoons were based on various historical aerial photographs (see Figure 2, Appendix I). The locations of these source areas were further refined by the subsurface soil investigation conducted in 1997 by ERT. This investigation confirmed that the canals and lagoons were not removed before the Claremont Development was built. The canal and lagoon found in the northern portion of the Claremont Development were designated as Canal A and Lagoon A, respectively. The maximum concentrations of total PAHs in Canal A and Lagoon A are 21,206 parts per million (ppm) and 77,363 ppm respectively. The canal and lagoon found in the southern portion of the development were designated as Canal B and Lagoon B, respectively. The maximum concentration of total PAHs found in Canal B was 21,417 ppm; the maximum concentration of total PAHs found in Lagoon B was 83,280 ppm.

The description and dimensions of the lagoons and canals provided below is based on the 1997 ERT data. Once the data is evaluated from the 1998/1999 subsurface sampling activities, these dimensions may change. Canal A extends approximately 400 feet from Valerie Road, through four residential properties on Valerie Drive to a point where it meets Lagoon A at 90 Valerie Drive. The canal is approximately eight feet wide, four to eight feet deep, with the upper surface about three feet below the present surface of the yards (see Figure 3, Appendix I).

Lagoon A is approximately 375 feet in length and extends through the backyards of 90, 98, 104, and 110 Valerie Drive. The top of Lagoon A is approximately eight to ten feet below ground surface and the lagoon is at least six feet thick in some places. In addition, an exit trench associated with Lagoon A apparently served as a drainage way for overflow material to exit the lagoon. This exit trench has been found along the back property lines of approximately four properties on Valerie Drive east of Lagoon A.

Canal B is approximately 1,500 feet in length and extends from the parking lot of the Rustic Mall near Summit Bank, along the north side of East Camplain Road, through 10 to 13 residential properties, to a point where it meets Lagoon B at 186 East Camplain Road. Like Canal A, Canal B is approximately eight feet wide. Very little fill was found above Canal B. The bottom of Canal B is estimated to range from several inches to eight feet below the ground surface.

Lagoon B extends about 300 feet from southwest to northeast. The lagoon is located on properties at 186, 192, 198, 204, and 210 East Camplain Road, and may extend into the back yard of 216 East Camplain Road.

The yards of these properties slope downward from the rear of the homes toward the back property boundary near the railroad tracks. Total elevation change is about six feet. Soil borings near the rear of the yards showed that the lagoon is within about two feet of the surface. Closer to the houses, the lagoon is about six feet below ground surface due to fill that was placed prior to construction of the homes. Lagoon B extends to a depth of 20 to 25 feet.

The total volume of the source areas is estimated to be 44,158 cubic yards based on the available data. However, this volume may change pending a review of the subsurface data.

SUMMARY OF SITE RISKS

PAHs associated with creosote are the main contaminants of concern at the site. Samples taken from the site were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals. Among the SVOCs analyzed were 23 PAH compounds, seven of which are classified as probable human carcinogens (see Table 1 in Appendix II). Historically, PAH compounds have been reported in several ways, including total PAH concentration (TPAH), total carcinogenic PAH concentrations (CPAH), and benzo[a]pyrene equivalents (BAP). TPAH is the sum of all PAH concentrations in a sample and is always greater than or equal to CPAH, which is the sum of the portion of PAHs classified by EPA as carcinogenic. BAP is a weighted concentration based on the individual carcinogenic PAHs and can be used to assess the carcinogenicity of CPAH in terms of benzo[a]pyrene, which is a carcinogenic PAH that has been extensively studied. See Table 2, in Appendix II for concentrations of PAHs found in the lagoon and canal areas of the site.

Data from the site indicate that the ground water, a source of drinking water, is contaminated with creosote from the lagoons. In addition, creosote was observed being discharged from a sump in a residence on Valerie Drive into the street. PAHs, due to their highly toxic and highly mobile nature at this site, are considered a principal threat. For these reasons, action is needed to address the principal threat source material in the lagoon areas.

Although the quantitative risk assessment for the subsurface soils has not yet been completed, site information indicates that an early interim action is needed quickly to prevent further environmental degradation and achieve a reduction in risk while a final remedial solution is being developed. Samples from the lagoon areas show that the concentrations of PAHs in Lagoon A were as high as 1,862 ppm, and PAHs in Lagoon B were found to be as high as 2,548 ppm (as BAP equivalents). Under a direct contact residential scenario, PAH concentrations that are above 9 ppm (BAP equivalents) exceed a 10-4 risk and indicate the need for action.

The more specific findings of the baseline risk assessment and the ultimate cleanup objectives for the site will be included in a subsequent ROD for the site.

The response action selected in this Record of Decision is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives are specific goals to protect human health and the environment. These objectives are based on available information and standards such as applicable or relevant and appropriate requirements (ARARs).

The following remedial action objectives were established for OU1 of the Federal Creosote site:

! Clean up the canal and lagoon source areas to levels that will allow for unrestricted land use.

! Remove as much source material as possible in order to minimize a potential source of groundwater contamination.

The current and reasonably anticipated future land use for most of the areas affected by the canals and lagoons is residential, and groundwater beneath the site is currently a source for the public water supply and, based upon NJDEP classification, is expected to provide drinking water in the future.

For this early interim action only, EPA has used a visible contamination threshold as the remediation goal, for cost and volume estimation purposes. EPA has not yet completed the baseline risk assessment and its associated quantitative determination of cleanup levels. Soil cleanup levels will be developed prior to the excavation of the creosote source material and any adjacent contaminated soil. This will ensure that all unacceptable material is removed in a single cleanup action.

DESCRIPTION OF REMEDIAL ALTERNATIVES

Section 121(b)(1) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. §9621 (b)(1), mandates that a remedial action must be protective of human health and the environment, be cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. Section 121(d) of CERCLA 42, U.S.C. §9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to section 121(d)(4) of CERCLA, 42 U.S.C. §9621(d)(4). CERCLA also requires that if a remedial option is selected that results in hazardous substances, pollutants, or contaminants remaining at a site above levels that allow for unlimited use and unrestricted exposure, EPA must review the action no less than every five years after the start of the action.

Based on information acquired from evaluating and cleaning up other wood treatment sites, EPA has undertaken an initiative to develop presumptive remedies to accelerate cleanups at these types of sites. The objective of the presumptive remedies initiative is to use the Superfund program's experience to streamline site characterization and speed up the selection of cleanup actions, ensure consistency in remedy selection, and reduce the cost and time required to clean up similar sites. In accordance with this initiative, and relying on the Agency's technology selection guidance for wood treatment sites, both bioremediation and thermal treatment (e.g., thermal desorption, incineration) were considered for the Federal Creosote site in the EE/CA.

In addition to the presumptive remedies, the EE/CA also considered a No Action alternative as a baseline for comparison with the presumptive remedies. Bioremediation, thermal treatment and containment are technologies that are sometimes implemented on site, but due to limited space, and the residential nature of the community, the on-site application of these technologies was eliminated during the screening phase. As a result, this ROD evaluates two remedial alternatives for addressing the contaminated material associated with the lagoons and canals. As referenced below, the time to implement a remedial alternative reflects only the time required to construct or perform the remedy and does not include the time required to relocate residents, design the remedy, and procure contracts for design and construction.

The remedial alternatives for the site are:

Alternative 1: No Action

Alternative 2: Excavation and Off-Site Thermal Treatment and Disposal

Alternative 1: No Action

Capital Cost: $0
Annual operation and
Maintenance (O&M): $0
Present Worth: $0
Time to Implement: not applicable

The Superfund program requires that the No Action alternative be evaluated at every site to establish a baseline for comparison.

Under this alternative, no further remedial actions would be taken to address the source areas. Because no action results in contaminants remaining on site above acceptable levels, the site would have to be reviewed every five years per the requirements of CERCLA.

Alternative 2: Excavation and Off-Site Thermal Treatment and Disposal

Capital Cost: $59,100,000
Annual Operation and
Maintenance (O&M): $0
Present Worth: $59,100,000
Time to Implement: 2 - 3½ Years

Alternative 2 includes the excavation and off-site transportation of the source materials associated with the lagoons (including the Lagoon A exit trench) and canals for thermal treatment and disposal. For this early interim action only, EPA has used a visible contamination threshold as the cleanup level for cost and volume estimation purposes. This is due to the fact that EPA has not yet completed the baseline risk assessment and its associated quantitative determination of cleanup levels. However, these subsurface soil cleanup levels can be developed prior to the excavation of the creosote source material and any adjacent contaminated soil. This can ensure that all unacceptable material is removed in a single cleanup action.

The time to implement does not include the necessary preliminary steps of designing the remedy or permanently relocating residents, which may each take up to one year, but can be conducted concurrently. In addition, the time to implement is shown as a range due to uncertainties relative to the exact number of houses that need to be underpinned prior to excavating, the extent of excavations in the canals, the exact number of houses that need to be temporarily and permanently relocated, and the extent to which both Canal/Lagoon A and Canal/Lagoon B can be remediated at the same time. Concurrent remediation of these areas may not be feasible if it adversely restricts access to the development. If these areas are remediated sequentially, the time to implement will be lengthened; however, the disruption to the whole development may be minimized.

As mentioned previously, EPA's proposed action would require the permanent relocation of residents from an estimated 10 to 19 properties, so that the houses can be demolished to excavate the source areas. Investigations to date indicate that ten houses in the Claremont Development have been built on top of or adjacent to the lagoon source areas and nine houses may have been built on the canal source areas.

For houses that may be located on the canal source areas, the number of permanent relocations needed to excavate the canals will be determined after the ongoing subsurface investigation is completed.

For the purpose of excavating the lagoons, the affected properties would need to be acquired by EPA and the residents permanently relocated. Following permanent relocation, the houses on these properties would be demolished. Based on current data, Lagoon A is believed to be located beneath the following properties: 90 Valerie Drive, 98 Valerie Drive, 104 Valerie Drive, and 110 Valerie Drive. It is estimated that Lagoon A would involve the excavation of approximately 7,200 cubic yards of soil. The depth of the excavation is currently estimated to be 16 feet. Based upon current data, Lagoon B is believed to be located beneath the following properties: 186 East Camplain Road, 192 East Camplain Road, 198 East Camplain Road, 204 East Camplain Road, 210 East Camplain Road, and may extend into the backyard of 216 East Camplain Road. To excavate the source area associated with Lagoon B, approximately 29,946 cubic yards of material would be removed.

It is estimated that approximately 3,012 cubic yards of material would be excavated from Canal A and the Lagoon A exit trench. It is further estimated that approximately 4,000 cubic yards of material would be excavated from Canal B. Residents of affected properties on Valerie Drive and East Camplain Road may need to be temporarily relocated during some or all of the excavation activities on their properties. It is anticipated that temporary relocation would be for a period of six months to one year. Because Canal A and Canal B are relatively shallow, structural engineering measures such as foundation underpinning may be used to remove the source areas from beneath these structures without demolishing the houses. However, until all of the subsurface data is received and evaluated, EPA cannot determine whether extensive contamination exists at depth on these properties that may result in the need to acquire more homes in order to excavate the canal contamination. During the excavation of Lagoon B, it is anticipated that portions of East Camplain Road may need to be closed to provide room for construction equipment.

During the excavation of the lagoons, the use of a prefabricated fabric structure (PFS) equipped with a ventilation system may be necessary to control noise, dust, odors, and to limit rain water in the excavation area. Air emissions from the PFS would be treated prior to discharge to the atmosphere. For canal excavation, the use of the PFS is not believed necessary. Air monitoring would be conducted during the excavation of the canal and lagoon areas.

The source material is a Resource Conservation and Recovery Act (RCRA) listed waste, and would be transported for off-site thermal treatment and disposal. In excavation areas, where houses would be demolished, the lots would be completely backfilled and would be revegetated and restored as open lots.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy, EPA considered the factors set out in section 121 of CERCLA, 42 U.S.C. §9621, by conducting a detailed analysis of the viable remedial alternatives pursuant to the National Contingency Plan (NCP), 40 CFR §300.430(e)(9) and OSWER Directive 9355.3-01. The detailed analysis consists of an assessment of the alternatives against each of nine evaluation criteria and comparative analysis focusing upon the relative performance of each alternative against those criteria.

The following "threshold" criteria must be satisfied by any alternative in order to be eligible for selection:

! Overall Protection of Human Health and the Environment draws on the assessments conducted under other evaluation criteria and considers how the alternative addresses site risks through treatment, engineering, or institutional controls.

! Compliance with ARARs evaluates the ability of an alternative to meet applicable or relevant and appropriate requirements (ARARs) established through Federal and State statutes and/or provides the basis for invoking a waiver.

The following "primary balancing" criteria are used to make comparisons and to identify the major trade-offs between alternatives:

- <u>Long-term Effectiveness and Permanence</u> evaluates the ability of an alternative to provide long-term protection of human health and the environment and the magnitude of residual risk posed by untreated wastes or treatment residuals.

- <u>Reduction of Toxicity, Mobility or Volume Through Treatment</u> evaluates the degree to which an alternative reduces risks through the use of treatment technologies.

- <u>Short-term Effectiveness</u> addresses the cleanup time frame and any adverse impacts posed by the alternative during the construction and implementation phase, until cleanup goals are achieved.

- <u>Implementability</u> is an evaluation of the technical feasibility, administrative feasibility, and availability of services and materials required to implement the alternative.

- <u>Cost</u> includes an evaluation of capital costs, annual operation and maintenance costs, and net present worth costs.

The following "modifying" criteria are considered fully after the formal public comment period on the Proposed Plan is complete:

- <u>State Acceptance</u> indicates the State's response to the alternatives in terms of technical and administrative issues and concerns.

- <u>Community Acceptance</u> evaluates the issues and concerns that the public may have regarding the alternatives.

A comparative discussion of the seven alternatives on the basis of the evaluation criteria presented above follows.

<u>Overall Protection of Human Health and the Environment:</u> Alternative 1, the no action alternative, would not be protective of human health and the environment because the site would remain in its current condition. Under this alternative, contaminated subsurface soils would remain in place at the site and would not be subject to a remedial action. The limited surficial soil covering over the lagoons and canals does not provide a protective barrier from exposure. In addition, under the no action alternative, the lagoons and canals would continue to serve as a source of groundwater contamination.

Under Alternative 2, excavation and off-site thermal treatment and disposal, all of the identified subsurface soils exhibiting signs of visible contamination would be excavated and thermally treated off site. EPA is currently describing this alternative based on visible cleanup goals since the baseline risk assessment and its associated quantitative determination of cleanup levels have not yet been completed. The subsurface soil cleanup levels will be developed prior to the actual removal of the creosote source material and any adjacent contaminated soil.

Excavation and off-site thermal treatment and disposal would eliminate: (1) the actual or potential exposure of residents to contaminated soils from lagoon and canal areas; and (2) the contaminants that might migrate to the groundwater. Any potential environmental impacts would be minimized with the proper installation and implementation of dust and erosion control measures, by performing excavation within a PFS where practicable, and if determined to be necessary, by conducting water pretreatment, and by using a lined temporary staging area.

There would be no local human health or environmental impacts associated with off-site disposal because the contaminants would be removed from the site to a secured location.

<u>Compliance with ARARs</u>: There are three types of ARARs: action-specific, chemical-specific, and location-specific. Action-specific ARARs are technology or activity-specific requirements or limitations. Chemical-specific ARARs establish the amount or concentrations of a chemical that may be found in, or discharged to, the environment. Location-specific ARARs are restrictions placed on concentrations of hazardous substances found in specific locations, or the conduct of activities solely because they occur in a specific location.

Actions taken at any Superfund site must meet all applicable or relevant and appropriate requirements of federal and state law or provide grounds for invoking a waiver of these requirements. Alternative 2 would comply with ARARs, Alternative 1 would not. Major ARARs are described below.

The Resource Conservation and Recovery Act is a federal law that mandates procedures for treating, transporting, storing, and disposing of hazardous substances. All portions of RCRA which are applicable or relevant and appropriate to the proposed remedy for the site would be met by Alternative 2.

The source materials associated with the two canals and lagoons consist of coal-tar creosote. Soils excavated from the site during remediation and all or part of the associated debris are a listed hazardous waste (F034) as defined in RCRA. As a listed hazardous waste, excavated material is subject to the Land Disposal Restrictions (LDRs) under RCRA.

The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, which provides regulations and guidance for the government in conducting relocation activities where property is acquired, is not an environmental law, but would have bearing on Alternative 2, which proposes permanent relocation. The Act provides for uniform and equitable treatment of persons displaced from their homes by federal programs. All portions of the Act that are applicable to the proposed action would be met by Alternative 2.

<u>Long-term Effectiveness and Permanence</u>: The no action alternative offers no long-term effectiveness and permanence. In contrast, the excavation and removal of the lagoons and canals would represent a permanent solution for a portion of the site, because the source material would be entirely removed from these areas and transported to a hazardous waste facility. In addition, the waste material would be treated to destroy the contaminants, providing for a permanent solution to the waste.

Off-site treatment/disposal at a secure, permitted hazardous waste facility for the source material is a technically viable and often used disposal technique. This option is reliable because the design of these types of facilities includes safeguards and would ensure the reliability of the technology and the security of the waste material.

<u>Reduction of Toxicity, Mobility or Volume</u>: The no action alternative does not provide for any reduction of toxicity, mobility, or volume of the waste material in the source areas.

In contrast, removal and treatment of principal threat source material significantly reduces the toxicity, mobility, and volume of contaminants through treatment. Thermal treatment generally treats organic contaminants by subjecting them to temperatures ranging from 900 to 2,000 degrees Fahrenheit. During thermal treatment, the toxicity of the source material would be reduced during volatilization when organic contaminants are driven off as gases and are captured or combustion converts the organic contaminants to less toxic compounds such as carbon dioxide, water, hydrogen chloride, and sulfur oxides.

<u>Short-term Effectiveness</u>: During excavation and staging of the source material, health and safety measures would be implemented to protect surrounding residents and field personnel from exposure to the contaminated materials. Any potential environmental impacts would be minimized with the proper installation and implementation of dust and erosion control measures, by performing excavation with appropriate health and safety measures, which may include a prefabricated structure where practicable, by conducting water pretreatment, and by using a lined temporary staging area. Appropriate transportation safety measures would be required during the shipping of the contaminated soil to the disposal facility.

<u>Implementability</u>: Excavation techniques are commonly used in construction and by environmental remediation firms. The

installation of side wall support systems and erection of prefabricated structures have also been employed at numerous and similar environmental remediation sites. Underpinning of houses during excavation has also been used at other Superfund remediation sites. The heavy equipment necessary to implement this alternative is readily available and typically used for excavation activities. Numerous vendors are available to procure or rent the necessary prefabricated structures. Also, the quantities of backfill soil needed for excavations are available.

The personnel required to operate the heavy equipment would require appropriate OSHA certifications (e.g., hazardous waste worker), in addition to being certified in the operation of the heavy equipment. Such individuals are readily available.

The property buyouts associated with permanent relocation would result in some scheduling uncertainties related to the time necessary to complete negotiations with all affected homeowners. In addition, various issues may arise during the negotiation process with the individual homeowners that can complicate and lengthen the acquisition process.

Permitted hazardous waste facilities for treating creosote-contaminated material are available and have the capacity to accept the estimated volumes of waste identified for removal. This treatment option is reliable because of the stringent design and operation requirements imposed by permits. Following thermal treatment, the treated material would be disposed of in a Subtitle C landfill. Publicly Owned Treatment Works (POTWs) are also available for receiving pretreated water collected during excavation operations for the response action.

During excavation and staging of the material, health and safety measures would be implemented to limit surrounding residents and field personnel from exposure to the contaminated materials. Excavation techniques could be implemented in a relatively short time period because the necessary equipment is readily available. Demolition of homes associated with excavations could be performed without specific or highly specialized construction controls.

Cost: The capital cost and present worth costs for Alternative 2 are $59,100,000. There is no annual operation and maintenance associated with Alternative 2. Table 3-5 in the Focused EE/CA provides detailed break down of the cost estimate.

State Acceptance: NJDEP has concurred with the selected remedy.

Community Acceptance: Based upon public comments addressed in the responsiveness summary (Appendix V), the community supports the selected remedy.

SELECTED REMEDY

EPA and NJDEP have determined, after reviewing the alternatives and public comments that Alternative 2, excavation and off-site thermal treatment and disposal, is the appropriate remedy for the site, because it best satisfies the requirements of section 121 of CERCLA, 42 U.S.C. §9621, and the NCP's nine evaluation criteria for remedial alternatives, 40 CFR §300.430(e)(9). The capital and present worth costs for this remedy are $59,100,000. There are no operation and maintenance costs associated with the remedy. Alternative 2 is comprised of the following components:

! Permanent relocation of residents from certain properties within the canal and lagoon source areas, and temporary relocation where necessary to implement the remedy;

! Excavation of source material from the canal and lagoon source areas, backfilling with clean fill, and property restoration as necessary; and

! Transportation of the source material for off-site thermal treatment and disposal.

Based on the information available at this time, EPA and NJDEP believe the selected alternative will be protective of human health and the environment, will comply with ARARs and will reduce the toxicity, mobility and volume of contaminants through treatment to the maximum extent practicable. Because the selected alternative will treat contaminated material, it will also meet the statutory preference for the use of a remedy that involves treatment as a principal element.

EPA plans to implement the selected alternative in a phased manner and will be initially moving forward with the relocation of affected residents. The relocation of residents and demolition of the houses must take place before any actual construction can begin. This process can take up to one year. However, the agency does not plan to begin the actual removal of the source area contamination until the site-wide RI/FS is completed. EPA believes that the full extent of contamination within the development should be known prior to the initiation of intrusive cleanup activities. As indicated previously, the available data indicate that 32 residential properties need to be remediated, ten to nineteen of which will require the permanent relocation of the residents. Based on this data, EPA believes that excavation and off-site thermal treatment of the lagoon and canal wastes, while maintaining the existing nature and character of the development, is the appropriate remedy for the site. It is not expected that the extent of this early interim action will significantly expand beyond the scope presented in this document. If, however, the source material is found to extend further beyond the properties identified in this document, then modification of this remedy will be addressed as part of the site-wide ROD. Any such modification would be subject to full public input and comment.

It should be noted that the site was reviewed by EPA's National Remedy Review Board. The Board, which includes senior representatives from EPA offices across the nation, was established to review proposed high-cost remedies and provide advisory recommendations relative to national consistency and cost effectiveness. Among its recommendations, the Board supports the need for action at the site including the region's plan to move forward with the relocation of affected residents necessary to address the highly contaminated lagoon and canal source areas. The Board also believes that, given the uncertainty regarding the extent of subsurface contamination on many properties within the development, and the potential affect of this uncertainty on the proposed remedial approach, the site-wide RI/FS should be completed prior to the removal of any source materials. The region intends to implement the selected alternative in a phased manner consistent with these recommendations.

STATUTORY DETERMINATIONS

As previously noted, section 121(b)(1) of CERCLA, 42 U.S.C. §9621 (b)(1), mandates that a remedial action must be protective of human health and the environment, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at the site. Section 121(d) of CERCLA, 42 U.S.C. §9621(d), further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to section 121(d)(4) of CERCLA, 42 U.S.C. 42 U.S.C. §9621(d)(4). As discussed below, EPA has determined that the selected remedy meets the requirements of section 121 of CERCLA 42 U.S.C. §9621.

Protection of Human Health and the Environment

The selected remedy is considered fully protective of human health and the environment. The treatment of the contaminated source material through a thermal treatment process will remove or destroy the organic contaminants. Treatment of the principal threat source material will result in the elimination of the potential direct human health threats posed by the soils, and will eliminate potential long-term sources of groundwater and surface water contamination.

Compliance with ARARs

At the completion of the response action, the selected remedy will have complied with all applicable ARARs, including:

Action Specific ARARS:

- National Ambient Air Quality Standards for Hazardous Air Pollutants

- RCRA - Land Disposal Restrictions

- RCRA - Standards Applicable to Transport of Hazardous Waste

- RCRA - Standards for Owners/Operators of Permitted Hazardous
Waste Facilities

- DOT - Rules for Transportation of Hazardous Materials

- OSHA - Safety and Health Standards

- OSHA - Record keeping, Reporting and related Regulations

- Uniform Relocation Assistance and Real Property Acquisition
Policies Act of 1970

Chemical-Specific ARARs:

- None applicable.

Location-Specific ARARs:

- None applicable.

A full list of ARARs and TBCs (e.g., advisories, criteria, and guidance) being utilized is provided in the Table in Appendix II.

Cost-Effectiveness

The selected remedy is cost-effective in that it provides overall effectiveness proportional to its cost. The total capital cost of the remedy is $59,100,000; no long-term operation and maintenance costs are expected. With respect to the total cost, approximately 36% of the cost is attributed to excavation, backfilling, and other activities (e.g., relocation, building demolition and disposal); the remaining 64% is attributed to transportation, thermal treatment, and landfilling of the source material. A detailed cost breakdown can be found in the Focused EE/CA.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

This early interim action is not designed or expected to be the final action for the site. EPA and NJDEP have determined that the selected remedy utilizes permanent solutions and treatment technologies to the maximum extent practicable for this operable unit, and represents the best balance of trade-offs among alternatives with respect to criteria, given the limited scope of the action. This determination was made based on the evaluation of alternatives with respect to long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, short-term effectiveness, implementability, and cost, as well as the statutory preference for treatment as a principal element, and State and community acceptance.

Preference for Treatment as a Principal Element

In keeping with the statutory preference for treatment as a principal element of the remedy, the remedy provides for the treatment of source materials (the lagoons and canals) which constitute the principal threat known to exist at the site.

DOCUMENTATION OF SIGNIFICANT CHANGES

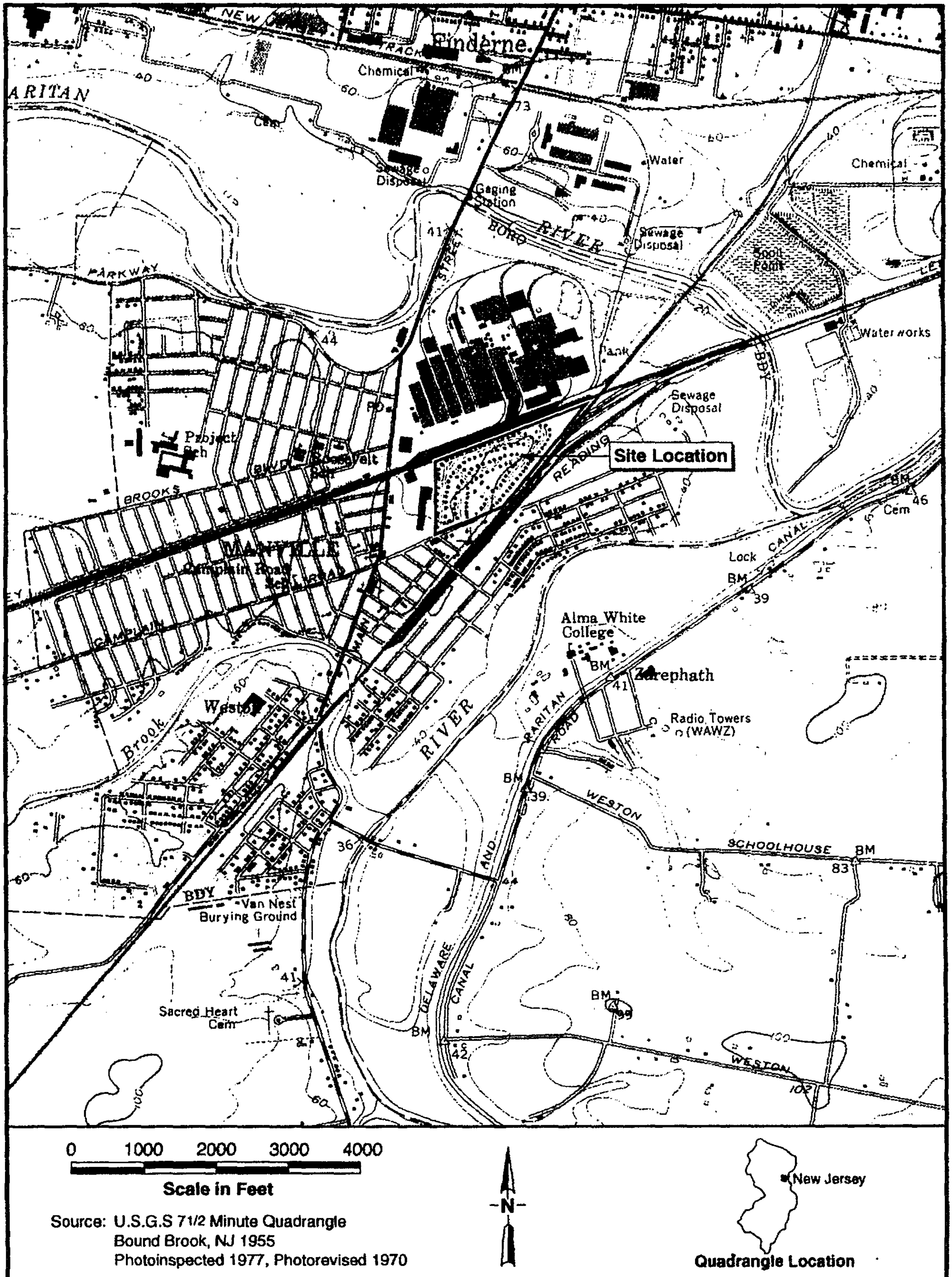
The Proposed Plan for the Federal Creosote site was released for a public comment period on April 30, 1999 that was scheduled to run until June 1, 1999. In response to a comment, the public comment period was extended to June 25, 1999 to provide additional information related to the preferred alternative.

The Proposed Plan identified Alternative 2, excavation and off-site thermal treatment, as the preferred response action. Thermal treatment in the proposed plan was defined as incineration. To provide flexibility of treatment for the source material, the definition of thermal treatment has been expanded to include both thermal desorption and incineration.

The cost of the preferred remedy in the Proposed Plan was erroneously presented as $58,000,000. The correct cost estimate for the remedy is $59,100,000.

All written and verbal comments submitted during the public comment period were reviewed by EPA. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

APPENDIX I



Source: U.S.G.S 71/2 Minute Quadrangle
Bound Brook, NJ 1955
Photoinspected 1977, Photorevised 1970

98P-2752

FIGURE 1

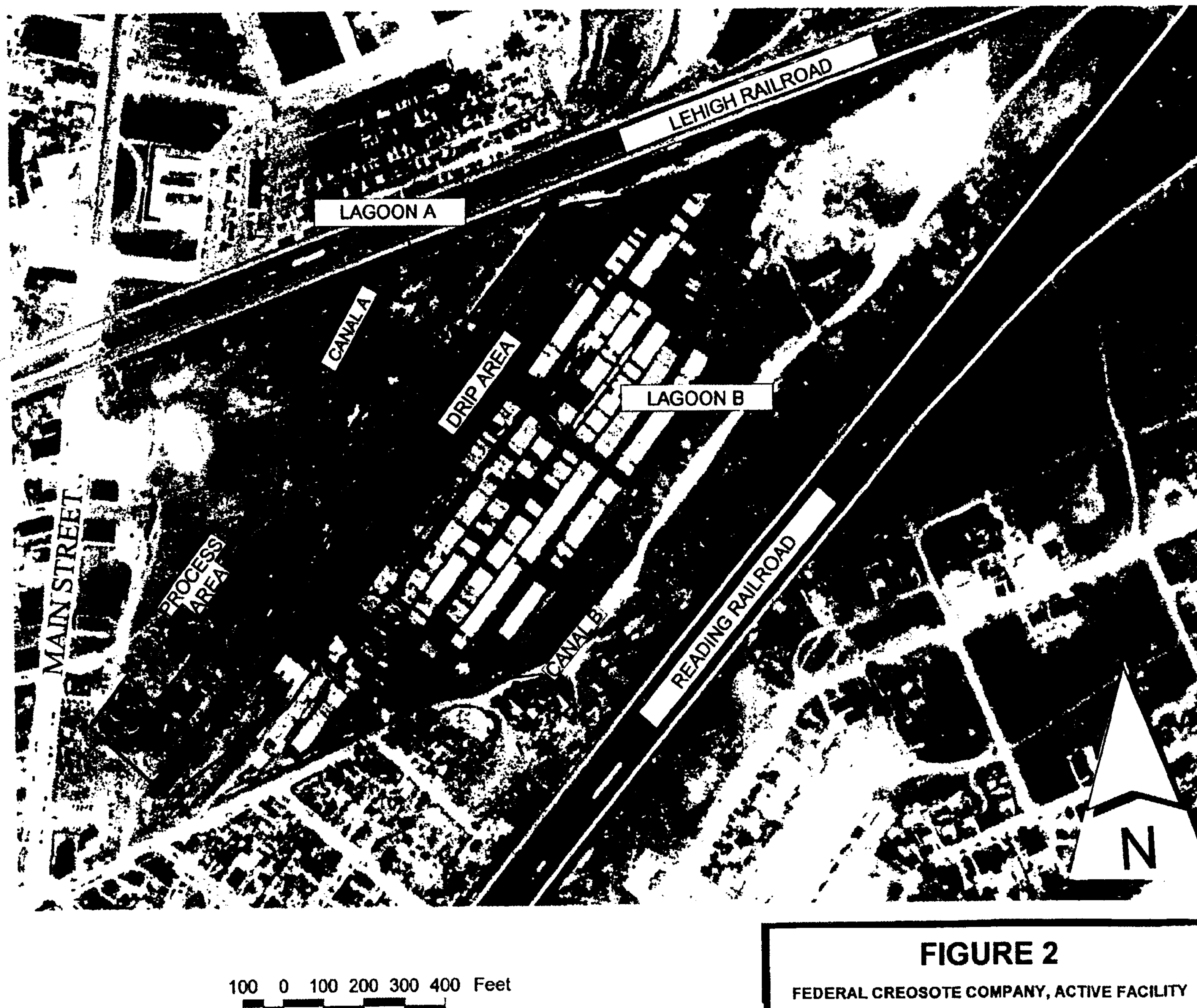


FIGURE 2

FEDERAL CREOSOTE COMPANY, ACTIVE FACILITY
FEDERAL CREOSOTE
MANVILLE, NEW JERSEY

FEDERAL CREOSOTE SITE

CLAREMONT DEVELOPMENT

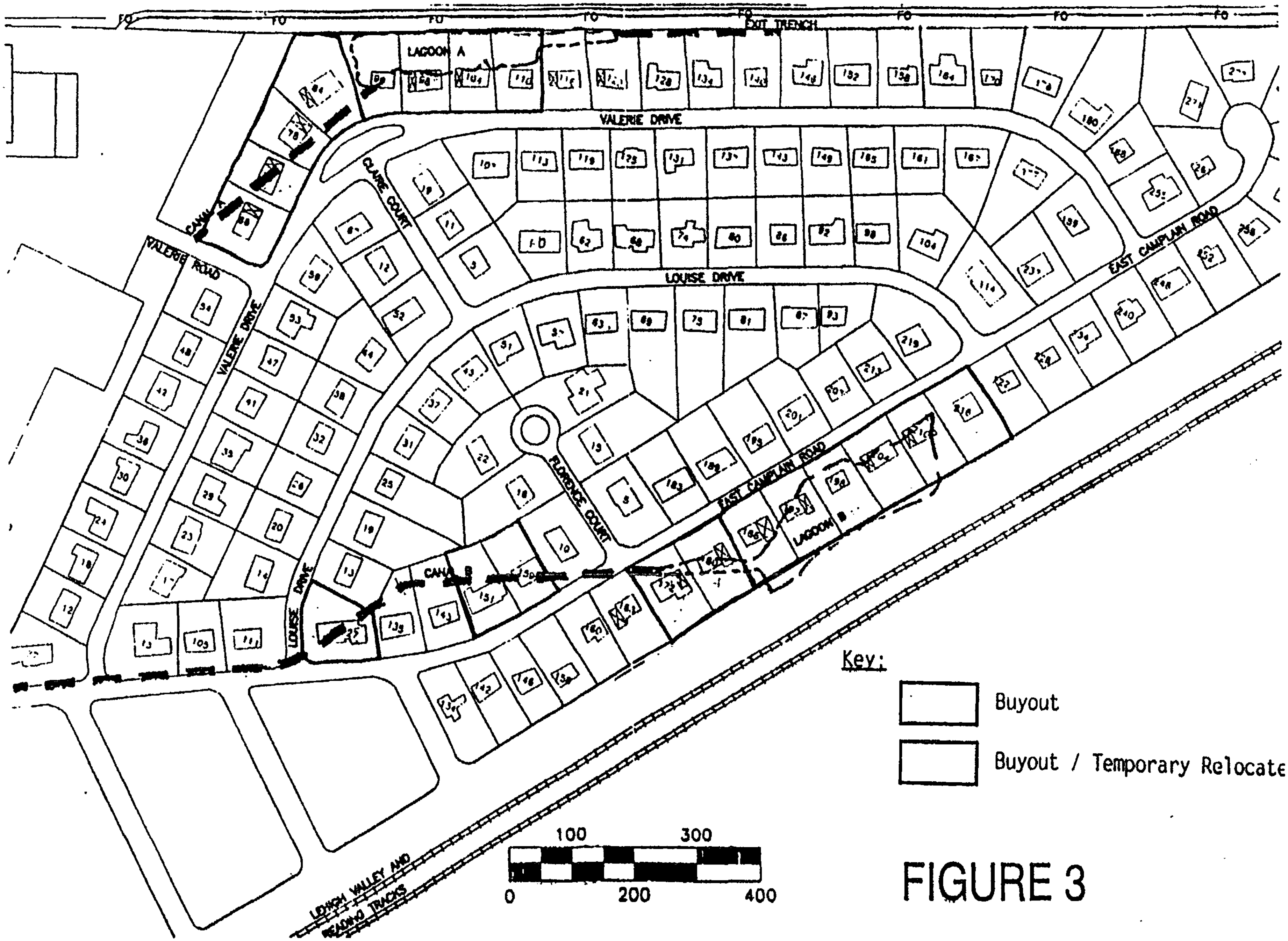


FIGURE 3

APPENDIX II

Table 1
List of Target PAHs

PAHs	
1	Naphthalene
2	2-Methylnaphthalene
3	1-Methylnaphthalene
4	Biphenyl
5	2,6-Dimethylnaphthalene
6	Acenaphthene
8	Dibenzofuran
9	Fluorene
10	Phenanthrene
11	Anthracene
12	Carbaxole
13	Fluoranthene
14	Pyrene
15	Benzo(a)anthracene*
16	Chrysene*
17	Benzo(b)fluoranthene*
18	Benzo(k)fluoranthene*
19	Benzo(e)pyrene
20	Benzo(a)pyrene*
21	Indeno(1,2,3-cd)pyrene*
22	Dibenzo(a,h)anthracene*
23	Benzo(g,h,i)perylene

* = Carcinogenic PAH (CPAH)

Table 2

Maximum Concentration of PAHs found in Lagoons and Canals

Location	TPAH (ppm)	CPAH (ppm)	BAP Equivalents (ppm)
Lagoon A	77,363	5,838	1,862
Canal A	21,206	1,315	357
Lagoon B	83,280	12,390	2,548
Canal B	21,417	2,135	595

TABLE 3-1

Chemical-Specific ARARs,
Federal Creosote Site,
Manville, NJ

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
Safe Drinking Water Act (SDWA)	40 USC 300 et seq.		
• National Primary Drinking Water Standards	40 CFR 141	Establishes health-based standards for public water systems (maximum contaminant levels [MCLs])	MCLs are ARARs in cases where affected groundwater is or may be used directly for drinking water.
• National Secondary Drinking Water Standards	40 CFR 143	Establishes welfare-based standards for public water systems (secondary maximum contaminant levels [SMCLs])	
• Maximum Contaminant Levels Goals	PL 99-339, 100 Stat. 642 (1986)	Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects, with an adequate margin of safety.	
Clean Water Act (CWA)	33 USC 1251 et seq.		
• Water Quality Criteria	40 CFR 131 Quality Criteria for Water, 1976, 1980, and 1986	Sets criteria for water quality based on toxicity to human health.	If water is discharged to surface water.
• Ambient Water Quality Criteria	40 CFR 131	Sets criteria for ambient water quality based on toxicity to aquatic organisms.	If water is discharged to surface water.
• Toxic Pollutant Effluent Standards	40 CFR 121	Establishes effluent standards or prohibitions for certain toxic pollutants; i.e., aldrin/diedrin, DDT, DDD, DDE, endrin, toxaphene, benzidine, and PCBs	If water treatment and discharge will be required during remediation.

TABLE 3-2

Schemical-Specific ARARs, Federal Creosote Site, Manville, NJ (Continued)

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
Resource Conservation and Recovery Act (RCRA)	42 USC 6901 et seq.		
! Identification and Listing of Hazardous Wastes	40 CFR 261	Defines those solid wastes that are subject to regulation as hazardous wastes under 40 CFR 262-265, 270, and 271.	For identification listed or characteristic RCRA wastes at a site.
! Releases from Solid Waste Management Units (SWMUs)	40 CFR 264, Subpart F	Establishes maximum concentration levels for specific contaminants from a solid waste management unit (SWMU).	Probably not ARARs for state Superfund sites.
! Land Disposal Restrictions (LDRs)	40 CFR 268	Establishes treatment standards for land disposal of hazardous wastes.	Applicable materials will be disposed of on land.
Clean Air Act (CAA)	42 USC 7401		
! National Ambient Air Quality Standards	40 CFR 50	Establishes primary and secondary standards for six pollutants to protect the public health and welfare.	These are ARARs for remedial alternatives that would result in emissions of the specific pollutants during implementation.
! National Emissions Standards for Hazardous Air Pollutants (NESHAPs)	40 CFR 61	Establishes regulations for specific air pollutants such as asbestos, beryllium, mercury, vinyl chloride, and benzene	Potentially not applicable to contaminants at this site.
! New Performance Standards for Criteria and Designated Pollutants	40 CFR 60	Establishes new source performance standards (NSPs) for certain classes of new stationary sources.	Potentially not applicable because the remediation will not involve a new source (e.g., an on-site incinerator) subject to NSPS

TABLE 3-3
Chemical-Specific ARARs,
Federal Creosote Site,
Manville, NJ
(continued)

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
State of New jersey Statutes and Rules	New Jersey Administrative Code (N.J.A.C.); New Jersey Statutes Annotated (N.J.S.A.)		
! Drinking Water Standards—maximum contaminant levels (MCLs)	58 N.J.S.A. 12A-1	Establishes MCLs that are generally equal to or more stringent than SDWA MCLs.	Although there are no local receptors and all properties are served by cit water, the underlying aquifer is a drinking water supply source.

TABLE 4-1

Location-Specific ARARs, Federal Creosote Site, Manville, NJ

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
National Historic Preservation Act	16 USC 469 et seq. 40 CFR 631(c)	Establishes procedures to provide for preservation of historical and archaeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	If historical or archaeological data could potentially be encountered during remediation.
Fish and Wildlife Coordination Act	16 USC 661-666	Requires consultation when federal department or agency proposes or authorizes any modification of any stream or other water body and adequate provision for protection of fish and wildlife resources.	Not an ARAR because the response actions will not affect surface water bodies.
Clean Water Act (CWA)	33 USC 1251-1376		
! **Dredge of Fill Requirements (Section 404)**	40 CFR 230-231	Requires dischargers to address impact of discharge of dredge or fill material on the aquatic ecosystem.	Not an ARAR because the response action will not involve discharge of dredge or fill into surface water body.
! **Executive Order on Flood Plain Management**	Executive Order 11988	Requires federal agencies to evaluate the potential effects of actions they may take in a flood plain to avoid, to the extent possible, the adverse impacts associated with direct and indirect development of a flood plain.	An ARAR if any portion of the site is within the 100-year flood plain.
New Jersey Flood Hazard Control Act	N.J.A.C. 7:13	State standards for activities within flood plains.	An ARAR for those aspects of the site work that are within the flood plain.
New Jersey Flood Freshwater Protection Act	N.J.S.A. 13:9B-1; N.J.A.C. 7:7A	Require permits for regulated activity disturbing wetlands.	Not an ARAR because no wetlands on site would be affected.

TABLE 4-2

Location-Specific ARARs,
Federal Creosote Site,
Manville, NJ
(Continued)

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
Endangered Species Act	16 USC 1531 et sep.; 40 CFR 400	Standards for the protection of threatened and endangered species.	Not an ARAR because no listed species identified at the site.
Endangered and Non-Game Species Act	N.J.S.A. 23:2A-1	Standards for the protection of threatened and endangered species.	Not an ARAR because no listed species identified at the site.
Fish and Wildlife Coordination Act	16 USC 661 et seq.	Requires conservation of fish and wildlife and their habitats.	Not and ARAR because this site does not contain fish and wildlife habitat.
New Jersey Uniform Construction Code	N.J.A.C. 5:23	Establishes standards for all new construction and renovation.	This may be ARAR to the extent that new construction falls within the standards.

TABLE 5-1

Action-Specific ARARs, Federal Creosote Site, Manville, NJ

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
Clean Water Act (CWA)	33 USC 1251-1376		
! National Pollutant Discharge Elimination system (NPDES)	40 CFR 125	Requires permit for the discharge of pollutants for any point source and stormwater runoff for specific Standard Industrial codes (SICs) into waters of the United States.	Substantive requirements for a permit will be required for discharge to a surface water body if water generated during the remediation is discharged to surface water.
! Effluent Guidelines and Standards for the Point Source Category	40 CFR 414	Requires specific effluent characteristics for discharge under NPDES permits.	Probably not applicable because there will be no ongoing commercial activity at a state Super fund site.
! National Pretreatment Standards	40 CFR 403	Sets standard to control pollutants that pass through or interfere with treatment processes in public treatment works or that may contaminate sewage sludge.	Only if the selected alternative includes discharge of water to a POTW.
Resource Conservation and Recovery Act (RCRA)	42 USC 6901-6987		
! Criteria for Classification of Solid Waste Disposal Facilities and Practices	40 CFR 257	Establishes criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on public health or the environment and thereby constitute prohibited open dumps.	Not an ARAR because on-site disposal is not an option at the site.
! Standards Applicable to Generators of Hazardous Wastes	40 CFR 262	Establishes standards for generators of hazardous wastes.	An ARAR because response action involves soil or water that would be considered hazardous under RCRA.

TABLE 5-2

Action-Specific ARARs,
Federal Creosote Site,
Manville, NJ
(Continued)

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
! Standards Applicable to Transporters of Hazardous Wastes	40 CFR 263	Establishes standards that apply to transporters of hazardous wastes within the United States if the Transportation requires a manifest under 40 CFR 262.	An ARAR because response action involves off-site transportation of soil or water that would be considered hazardous under RCRA
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDFs)	40 CFR 264	Establishes minimum national standards that define the acceptable management of hazardous wastes for owners and operators of facilities that treat, store, or dispose of hazardous wastes.	Part 264 Requirements may be ARARs for certain remedial actions under CERCLA. See each Subpart that follows.
! General Facility Standards	Subpart B	Establishes minimum standards for treatment, storage, and disposal facilities (TSDFs)	may be an ARAR if any remedial actions are selected for which other subparts of 264 are relevant and appropriate.
! Preparedness and Prevention	Subpart C	Establishes minimum standards for hazard management.	Not an ARAR because on-site storage or treatment will be conducted.
! Contingency Plan and Emergency Procedures	Subpart D	Establishes minimum standards for hazard management.	Not an ARAR because on-site storage or treatment will be conducted.
! Manifest System, Recordkeeping, and Reporting	Subpart F	Establishes standards for tracking wastes during off-site transport.	An ARAR because response action will involve off-site transport of hazardous waste.
! Releases from solid Waste Management Units (SWMUs)	Subpart F	Establishes standards for control of SWMUs	Not an ARAR because response action will not involve on-site disposal.

TABLE 5-3

Action-Specific ARARs, Federal Creosote Site, Manville, NJ (Continued)

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
! Closure and Post-Closure	Subpart G	Establishes standards for site closure.	CERCLA establishes review of remedial actions should contaminants be left on-site. Substantive requirements need to be met including monitoring and deed notices.
! Financial Requirements	Subpart H	Establishes administrative requirements for demonstrating fiscal responsibilities.	These are administrative requirements only.
! Use and Management of Containers	Subpart I	Establishes standards for container storage.	May be ARARs if an alternative would involve storage of containers of hazardous wastes.
! Tanks	Subpart J	Establish standards for tank storage and handling.	May be ARARs if an alternative would involve use of tanks to treat or store hazardous materials.
! Surface Impoundments	Subpart K	Establishes standards for surface-impounded wastes.	Not an ARAR because alternatives would not involve a surface impoundment to treat, store, or dispose of hazardous materials.
! Waste Piles	Subpart L	Established standards for managing wastes in plies.	Not an ARAR because alternatives would not treat or store hazardous materials in piles.
! Land Treatment	Subpart M	Establishes standards for managing land treatment	Not an ARAR because alternatives would not involve on-site treatment.

TABLE 5-4

Action Specific ARARs, Federal Creosote Site, Manville, NJ (Continued)

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
! Landfills	Subpart N	Establishes standards for managing landfills.	May be ARARs if an alternative would involve disposal of hazardous materials in a landfill.
! Incinerators	Subpart O	Establishes standards for incineration of wastes.	May be ARARs if an incinerator alternative is selected
! Interim Standard for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR 265	Establishes minimum national standards that define the acceptable management of hazardous wastes during the period of interim status and unit certification of final closure or if the facility is subject to post-closure requirements, until post-closure responsibilities are fulfilled.	Remedies should be consistent with the more stringent Part 264 standards, as these represent the ultimate RCRA compliance standards and are consistent with CERCLA's goal of long-term protection of public health and welfare and the environment.
! Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities	40 CFR 266	Establishes requirements that apply to recyclable materials that are reclaimed to recover economically significant amounts of precious metals.	Does not establish additional cleanup requirements.
! Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities	40 CFR 267	Establishes minimum standards that define acceptable management of hazardous wastes for new land disposal facilities.	Remedies should be consistent with the more stringent Part 264 standards, as these represent the ultimate RCRA compliance standards and are consistent with CERCLA's goal of long-term protection of public health and the environment.

TABLE 5-5

Action-Specific ARARs, Federal Creosote Site, Manville, NJ (Continued)

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
! Land Disposal Restrictions	40 CFR 268	Identifies hazardous wastes that are restricted from land disposal and describes those circumstances under which an otherwise prohibited waste may be disposed of on land.	An ARAR because alternatives include land application of waste.
! Hazardous Waste Permit Program	40 CFR 270	Establishes provisions covering basic EPA permitting requirements.	A permit is not required for on-site CERCLA response action. Substantive requirements are addressed in 40 CFR 264.
! Underground Storage Tanks	40 CFR 280	Establishes regulations related to underground storage tanks (USTs)	No alternative involving the use of USTs is anticipated.
! Resource Conservation and Recovery Act (RCRA) Rule Change	57 FR 37193	Addresses the LDRs for hazardous debris.	An ARAR because debris is present.
! Corrective Action Management Units (CAMUs) and Temporary Units (TUs)	40 CFR, Subpart S, Part 264	Enables availability of CAMUs to those who initiate corrective action and seek agency approval under RCRA	Not an ARAR.
! RCRA LDRs, Phase II	57FR 27880, 30657, 37284, 47376, and 6149	Establishes a list of items considered industrial waste as a solid or hazardous waste.	Not applicable because there will be no ongoing commercial activity.
! RCRA LDRs, Phase II	57 FR 12	EPA clarification that a waste is not presumptively hazardous merely because it contains a Appendix VIII hazardous waste constituent.	Applicable if ongoing commercial activity occurs.

TABLE 5-6

Action-Specific ARARs,
Federal Creosote Site,
Manville, NJ
(Continued)

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
Hazardous Materials Transportation Act (HMTA)	49 USC 1801-1813		
! Hazardous Materials Transportation Regulations	49 CFR 107, 171-1777	Regulates transportation of hazardous materials.	An ARAR because response action would involve transportation of hazardous materials
Clean Air Act (CAA)	42 USC 7401		
! Permitting	40 CFR 61	Requires permits for the discharge of pollutants for point sources, area sources, or fugitive emissions.	Substantive requirements for a permit will be required for discharge from the excavation enclosure.

Table 5-7

Action-Specific ARARs, Federal Creosote Dite, Manville, NJ (Continued)

Standard Requirements, Criteria, or Limitations	Citation	Description	Comments
• RCRA LDRs, Phase II	57 FR 21524 as corrected by 57 FR 29220	Establishes management standards for recycled oils.	Not applicable because recycled oils are not present
• RCRA	40 CFR 265	Establishes organic air emission standards for tanks, surface impoundments, and containers.	Applicable to hazardous waste treatment, storage, and disposal facilities (TSDFs) that receive new or re-issued permits or Class 3 modifications after 5 January 1995.
• RCA LDRs, Phase II	EPA, 976 F.2d 2, 17-18 (D.C. Cir 1992)	Establishes universal treatment standards and treatment standards for organic toxicity characteristic wastes and newly listed wastes.	May be applicable to listed or characteristically hazardous wastes for which a treatment standard has been promulgated, landfilling is planned, and the CAMU/TU regulations do not apply.
• RCRA LDRs, Phase IV	40 CRF 268.30 and 268.40	Establishes specific land disposal prohibitions and treatment standards for wood-preserving wastes.	An ARAR because response actions will involve off-site treatment and disposal of F034 wastes.
Occupational Safety and Health Act (OSHA)	29 USC 651-578	Regulates worker health and safety.	Under 40 CFR 300.38, requirements of the act apply to all response activities under the NCP.
Safe Drinking Water Act (SDWA)	40 CFR 144-147		
• Underground Injection Control Regulations	40 CFR 144-147	Provides for protection of underground sources of drinking water.	Not an ARAR because response action does not involve groundwater remediation.

APPENDIX III

FEDERAL CREOSOTE SITE
ADMINISTRATIVE RECORD FILE
INDEX OF DOCUMENTS

1.0 SITE IDENTIFICATION

1.4 Site Investigation Reports

P. 100001-100189 Report: Technical Memorandum - Site Investigation, Federal Creosote Site, Manville, NJ, prepared by Roy F. Weston, Inc., prepared for U.S. EPA/ERTC, November 1998.

2.0 REMEDIAL RESPONSE

2.4 EE/CA

P. 200001-200269 Report: Focused Engineering Evaluation/Cost Analysis (EE/CA), Technical Memorandum for the Subsurface Soils Associated with the Historic Lagoons and Canals at the Federal Creosote Site, Manville, Somerset County, New Jersey, prepared by Region II Superfund Technical Assessment and Response Team, Roy F. Weston, Inc., prepared for U.S. EPA, Region II, 6 April 1999.

P. 200270-200832 Report: Engineering Evaluation/Cost Analysis for the Subsurface Soils Associated with the Historic Canals and Lagoons at the Federal Creosote Site Manville, Somerset County, New Jersey, prepared by Region II Superfund Technical Assessment and Response Team, Roy F. Weston, Inc., prepared for U.S. EPA, Region II, 6 April 1999.

8.0 HEALTH ASSESSMENTS

8.1 ATSDR Health Assessments

P. 800001-800272 Report: Interim Surface Soils, Human Health Risk Assessment, Federal Creosote Site, Manville, New Jersey, prepared by CDM Federal Programs

		Corporation, prepared for U.S. EPA, Region II, January 13, 1999.
P.	800273- 800281	Report: <u>Health Consultation, Federal Creosote Site, Manville, Somerset County, New Jersey, CERCLIS NO. NJ0001900281</u>, prepared by Exposure Investigation and Consultation Branch, Division of Health Assessment and Consultation, Agency for Toxic Substances and Disease Registry, prepared for U.S. EPA, Region II, February 11, 1999.

10.0 PUBLIC PARTICIPATION

10.3 Public Notices

P.	10.00001- 10.00001	Notice: EPA To Start Soil Sampling, prepared by U.S. EPA, Region II, undated.
P.	10.00002- 10.00002	Notice: EPA To Hold A Community Meeting, prepared by U.S. EPA, Region II, undated.
P.	10.00003- 10.00003	Notice: EPA Soil Sampling In Your Neighborhood, Update, prepared by U.S. EPA, Region II, undated.
P.	10.00004- 10.00004	Notice: Community Update, prepared by U.S. EPA, Region II, undated.
P.	10.00005- 10.00005	Notice: Upcoming Field Activities In Your Community, prepared by U.S. EPA, Region II, undated.
P.	10.00006- 10.00006	Notice: Public Meeting Agenda, Public Meeting to Discuss Remedial Activities for the Federal Creosoting Plant, prepared by NJDEP, Site Remediation Program, Bureau of Community Relations, April 16, 1997.
P.	10.00007- 10.00007	Notice: Public Meeting Agenda, Public Meeting to Discuss the Federal Creosote Plant Site, prepared by NJDEP, Site Remediation Program, Bureau of Community Relations, September 10, 1997.
P.	10.00008- 10.00008	Notice: Site Update, Federal Creosote Site, Manville Borough, Somerset County, prepared by NJDEP, Site Remediation Program, Bureau of Community Relations, January 21, 1998.

P. 10.00009- 10.00010 Notice: Federal Cresote Superfund Site, prepared by U.S. EPA, Region II, October 1998.

10.6 Fact Sheets and Press Releases

P. 10.00011- 10.00012 Fact Sheet: Federal Creosoting Plant, Manville Borough, Somerset County, Sampling Activities Planned at Development Site, prepared by NJDEP, Site Remediation Program, Bureau of Community Relations, April 16, 1997.

P. 10.00013- 10.00013 Fact Sheet: Federal Creosote Site, Manville Borough, Somerset County, Focused Soil and Ground Water Sampling Planned, prepared by NJDEP, Site Remediation Program, Bureau of Community Relations, September 10, 1997.

P. 10.00014- 10.00014 Fact Sheet: Fact Sheet on the Proposed Plan, prepared by U.S. EPA, Region 2, April 1999.

10.9 Proposed Plan

P. 10.00015- 10.00029 Plan: Superfund Proposed Plan, Federal Creosote Site, Manville, New Jersey, prepared by U.S. EPA, Region II, April 1999.

P. 10.00030- 10.00032 Memorandum to Mr. Richard L. Caspe, Director, Emergency and Remedial Response Division, U.S. EPA, Region II, from Mr. Bruce K. Means, Chair, National Remedy Review Board, Office of Solid Waste and Emergency Response, re: National Remedy Review Board Recommendations for the Federal Creosote Superfund Site, May 3, 1999.

11.0 TECHNICAL SOURCES AND GUIDANCE DOCUMENTS

11.1 EPA Headquaters

P. 11.00001- 11.00059 Report: Presumptive Remedies for Soils, Sediments and Sludges at Wood Treater Sites, prepared by U.S. EPA, Office of Solid Waste and Emergency Response, December 1995.

APPENDIX IV

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection

Rober C. Shinn, Jr.
Commissioner

Ms. Jeanne M. Fox
Regional Administrator
U.S. EPA - Region II
290 Broadway
New York, NY 10007-1866

Subject: **Federal Creosote Superfund Site**
Record of Decision (ROD)

Dear Ms. Fox:

The New Jersey Department of Environmental Protection (NJDEP) has evaluated and concurs with the components of the selected remedy as described below for the Federal Creosote Superfund Site. The selected remedy corresponds to the first planned operable unit for the Site which includes properties located in Manville Borough, Somerset County, New Jersey.

The major components of the selected remedy include:

- Permanent relocation of residents from and estimated 10 to 19 properties so that the houses can be demolished for the excavation of contaminated source material.
- Excavation of buried lagoons and canals that are considered source areas of the creosote contamination.

NJDEP concurs that the selected remedy is protective of human health and the environment, complies with requirements that are legally applicable or relevant and appropriate for the remedial action, and is cost effective.

The State of New Jersey appreciates the opportunity afforded to participate in the Superfund process.

Sincerely,

Robert C. Shinn, Jr.
Commissioner
New Jersey Department of Environmental Protection

APPENDIX V

APPENDIX V

RESPONSIVENESS SUMMARY
FEDERAL CREOSOTE SUPERFUND SITE
MANVILLE, NEW JERSEY

INTRODUCTION

This Responsiveness Summary provides a summary of the public's comments and concerns regarding the Proposed Plan for the Federal Creosote site and the U.S. Environmental Protection Agency's (EPA's) responses to those comments. At the time of the public comment period, EPA had proposed a preferred alternative for remediating the source material contained in the buried lagoons and canals which has been designated as Operable Unit 1 (OU1). All comments summarized in this document have been considered in EPA's final decision for selection of a remedial alternative for OU1.

EPA held a public comment period to solicit community input and ensure that the public remains informed about site activities. EPA's Proposed Plan for Operable Unit 1 was released to the public on April 30, 1999. A copy of the Proposed Plan was placed in the Administrative Record and was made available in the information repository at the Manville Public Library. A public notice was published in The Manville News and The Courier-News on April 30, 1999, advising the public of the availability of the Proposed Plan. The notice also announced the opening of a 30-day public comment period and invited all interested parties to an upcoming public meeting. In response to a request from a concerned party, the public comment period was extended to June 25, 1999.

The public meeting to present the preferred remedial alternative for OU1 was held at the Weston Elementary School, Newark Avenue, Manville, New Jersey on May 12, 1999, at 7:00 p.m.

This Responsiveness Summary is divided into the following sections:

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS: This section provides the history of community involvement and interests regarding the Federal Creosote site.

II COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS AND RESPONSES: This section contains summaries of oral comments received by EPA at the public meeting, EPA's responses to these comments, as well as responses to written comments received during the public comment period.

The last section of this Responsiveness Summary includes appendices which document public participation in the remedy selection process for this site. There are four appendices attached to this Responsiveness Summary. They are as follows:

Appendix A contains the Proposed Plan that was distributed to the public for review and comment;

Appendix B contains the public notice which appeared inthe Courier-News;

Appendix C contains the transcripts of the public meeting; and

Appendix D contains the written comments received by EPA during the public comment period.

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

NJDEP and EPA have taken an active role in community involvement at the site. Community relations activities included:

- Public meeting held by NJDEP to explain history of the site and plans for future investigations (April 16, 1997).

- Public meeting held by NJDEP updating residents of preliminary findings and providing plans for future investigations (September 10, 1997).

- Public meeting held by EPA to discuss plans to install monitoring wells and sample the soil on each property in the Claremont Development (January 21, 1998).

- EPA circulated a flyer to request residents to sign access agreements which give the Agency permission to conduct soil sampling on their properties (February 10, 1998).

- EPA prepared and distributed a fact sheet to inform affected residents and local officials of site investigations and upcoming actions. The fact sheet also contained information on health issues, EPA contact persons, and the contacts for the Community Advisory Group (May 1998).

- EPA held a public meeting to release surface sampling results and to inform residents of future plans, including subsurface soil sampling in Fall 1998 and additional groundwater sampling in Spring 1998 (July 1998).

- EPA circulated a flyer to announce the start of subsurface soil sampling within the development, and describe the sampling process and equipment to be used. The flyer also presented a schedule for field investigations (November 15, 1998).

- EPA issued a press release to announce that it had placed the Federal Creosote site on the final National Priorities List (January 19, 1999).

- A citizens advisory group meeting was held. EPA provided residents information on the progress of the investigations as well as a schedule of upcoming events (February 9, 1999).

- EPA representatives met individually with homeowners whose houses are located either adjacent to or over lagoon and canals to explain the data they had received concerning their property (week of March 15, 1999).

- EPA held a community meeting to inform residents of the progress of ongoing site investigations and possible options that may be considered for properties located in lagoon and canal areas (March 18, 1999).

- A community update flyer was distributed by EPA to members of the community summarizing the meeting of March 18th and providing a map to each resident depicting lagoon and canal areas (March 22, 1999).

- EPA provided a flyer to all residents of the community informing them of upcoming field activities in the development that included additional sampling of specific properties and surveying of sampling points (March 1999).

- A citizens advisory group meeting was held with EPA. EPA presented to the residents information about the availability of a Technical Assistance Grant (March 31, 1999).

- Community interviews were conducted by EPA with Claremont Development residents, local officials, and other interested parties to assess their current issues and concerns (April 1999).

- EPA established an information repository for the site at the Manville Public Library on 100 S. 10th Avenue (April 29, 1999).

- EPA placed a notice in The Manville News and The Courier-News to announce the release of the Proposed Plan and Engineering Evaluation/Cost Analysis (EE/CA) Report, the opening of a 30-day public comment period, and a public meeting on May 12, 1999 (April 30, 1999).

- EPA opened the public comment period on the Proposed Plan, scheduled to run from April 30, 1999 to June 1, 1999.

- Flyers were sent to each residence within the Claremont Development reminding people of the upcoming public meeting and providing additional information about field activities being conducted in the neighborhood in the upcoming two weeks (May 3, 1999).

- EPA held a public meeting to provide an opportunity for public comment on the preferred alternative for the first operable unit, the lagoon and canal areas in the Claremont Development. Over 100 local residents attended the meeting at Weston School (May 12, 1999).

- An open house was held in the EPA field office where the public was invited to ask questions and obtain additional information about how EPA conducted remediation work in other residential neighborhoods similar to the Claremont Development (June 2 & 3, 1999).

- In response to a public comment, EPA extended the comment period to June 25, 1999.

Community concerns have centered around the impact that soil contamination in the development may have on the quality of life as well as the associated economic impact on the value of property in the Claremont Development. Additional community concerns regarding site cleanup activities were raised during the May 12th public meeting and are summarized in Section III below.

II. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS, AND RESPONSES

This section summarizes comments received from the public during the public comment period, and EPA's responses.

A. SUMMARY OF QUESTIONS AND EPAs RESPONSES FROM THE PUBLIC MEETING CONCERNING THE FEDERAL CREOSOTE SITE - MAY 12, 1999

A public meeting was held May 12, 1999, at 7:00 p.m. at the Weston Elementary School, Newark Avenue, Manville, New Jersey. Following a brief presentation of the investigation findings, EPA presented the Proposed Plan and preferred alternative for the Federal Creosote site. Comments raised by the public following EPA's presentation are categorized by relevant topics and presented as follows:

1. Permanent and Temporary Relocation
2. Remedial Construction
3. Health Concerns
4. Funding the Preferred Remedy
5. Property Ownership issues and Potential Liability to Homeowners

1. Permanent and Temporary Relocation

Comment #1: As part of the preferred alternative, ten to nineteen houses would be demolished so that the lagoon source areas may be excavated. Several questions were raised about the disposition of the property during the remedial construction phase of the project including: is it necessary for the government to buy the land; can the property owners own the land, and build new homes on their land once remediation is completed; if this option is chosen by the property owner, will the property owner get enough money to rebuild what they have?

Response: Entering into an arrangement with a property owner by which the party retains ownership of the land and EPA purchases the structure is an option that can be made available to affected property owners at the site. Homeowners who retain ownership of the land would receive compensation for the present value of the structure which is to be removed.

Comment #2: One commenter suggested that EPA buy out the entire community and offer everybody $150,000, instead of implementing the preferred remedy.

Response: The issue of property purchase in the Claremont Development by EPA is triggered by the need to excavate source material. If source material exists within close proximity of a structure such that excavation would endanger its structural integrity or threaten the safety of area residents and remediation workers, then that property would be purchased and the structure demolished. At present, EPA believes it is necessary to purchase ten to nineteen properties and demolish the associated structures so that the source material can be excavated. However, additional data will determine whether there is a need to purchase other properties in the Claremont Development in order to excavate source material.

Comment #3: The Proposed Plan states that it may be necessary to temporarily relocate residents other than those who reside in houses with canals beneath them, particularly residents on East Camplain Road and Florence Court, due to a possible road closure. The following questions were raised concerning the possibility of temporary relocation of esidents located on Florence Court and

East Camplain Road: Is temporary relocation mandatory? To avoid temporary relocation, would it be possible to park on another street and walk to our homes?

Response: Temporary relocation is a voluntary program. If it becomes necessary to close a portion of a road during construction, EPA would make temporary relocation available to residents directly affected by such a closure on a voluntary basis. If a road closure becomes necessary, those residents directly affected by limited access to their homes may either be temporarily relocated or may park their vehicles on another street and walk to their house.

Comment #4: Do the temporarily relocated residents find their own apartments or does EPA find an apartment for them? Who pays the rent? Is there a certain amount that EPA would allow for rent?

Response: Should EPA offer to temporarily relocate a resident and the resident agrees to be temporarily relocated, EPA would find a rental property for that resident and make payments directly to the landlord. The resident would continue to have financial responsibility for his/her home (e.g. mortgage). If a resident finds their own rental property, the amount of rent a temporarily relocated resident would be entitled to would be based on a typical rent for a rental property in Manville.

Comment #5: If we live in a home with 3 bedrooms, have a yard and a basement, how does EPA accommodate us during temporary relocation - do we get a comparable living situation?

Response: Temporarily relocated residents may choose from a range of lodging options, depending on family size and needs. These include apartments and single-family houses that are available in the area. Consideration will be given to family size, commuting patterns to work and school, whether the family has pets and personal preferences. Relocation specialists will work with families to help identify their needs and preferences.

Comment #6: A resident asked if security personnel would be provided to watch houses during the period of temporary relocation.

EPA Response: Twenty-four hour security would be provided during the cleanup activities.

Comment#7: A resident expressed concern that EPA had indicated it could take up to one year to complete the permanent relocation of affected property owners, and that seemed like a long time.

EPA Response: EPA estimates that the permanent relocation process will take nine months to one year, from the start of the process until the last person is permanently relocated. It is EPA’s experience that some relocations will progress quickly and others may take up to one year.

Comment #8: Should homeowners in the drip area continue to invest their money in their homes to do general maintenance?

EPA Response: Sampling results for the subsurface soil conditions will be provided to residents this summer. These results will indicate if other source areas are present in the development. Should other areas of source material be identified in the community, it may be necessary to purchase additional properties to excavate such material. Therefore, it is recommended that residents wait until this data is provided to them before major home renovation projects are implemented.

2. Remedial Construction

Comment #9: As part of construction activities, EPA plans to control dust and odors to the maximum extent practicable. Several questions were raised concerning dust and odors including: how does EPA plan to control odor and dust; can EPA power wash houses surrounding the construction area to remove dust from the houses; will odors and dust get into peoples houses and into their carpets, and if so, will EPA replace those carpets?

EPA Response: EPA will take measures to control dust and odors during remedial construction activities. The specific engineering controls used to limit dust and odor emissions will be considered during the design stage of the project. EPA’s efforts in dust control would focus on preventing the migration of any potentially contaminated dust. However, EPA has pressure-washed buildings at other sites to remove dust from non-contaminated construction activities. Odor controls will be put in place to limit odors during remediation activities. It is not anticipated that odors will penetrate carpeting to such an extent that EPA will need to replace it.

Comment #10: One resident inquired if it would be possible to move a house that is located above the canal source area, dig out the source material, and then replace the house back on its original location.

EPA Response: The EE/CA report considered moving houses off their foundations to remove the source material; however, due to space limitations, this was not considered practicable. In other residential communities with contamination beneath houses, EPA has underpinned the foundation of the house, and removed the contaminated material. Underpinning is an alternative to demolition. However, use of such an option is dependent on the lateral and vertical extent of source material found in the deep soils on the property. Deep soil sample results that will provide information on the extent of source material in the community will be available this summer. This information will be a significant factor in the decision on whether a structure may be underpinned or may need to be demolished to safely remove source material.

Comment #11: Several questions/comments were raised about the time of operation of cleanup activities and length of time it would take to complete construction activities. These questions/comments were: What hours and days will construction activities be conducted; if this site is a priority, would seven days a week be necessary to get the site cleaned up in an expedited fashion; if resources applied to the cleanup are doubled, the work will be completed in half the time; how long will the cleanup take; which lagoon will be cleaned up first, lagoon A or lagoon B?

EPA Response: It is anticipated that construction activities will be carried out five days a week from approximately seven o’clock in the morning to five o’clock in the evening. As at other remediation sites situated in residential neighborhoods, remedial workers typically arrive at the site at seven o’clock in the morning. At that time, health and safety meetings are conducted and the day’s activities are planned and coordinated. Operation of heavy equipment may not start until an hour later. Community input will be taken into consideration in establishing the hours of construction activities.

EPA realizes that the schedule of construction activities would be shortened if construction were to take place seven days a week or if resources allocated to the work were doubled. However, these approaches may pose a great deal of inconvenience and burden on the community. Community input during the design phase of the project will be solicited to achieve a balance between the speed of remediation and community disruption.

It is anticipated that cleanup of the lagoon and canal areas would be completed in three and a half to four years. This time frame includes approximately one year to design and relocate the residents, and two to three and a half years to conduct remedial construction activities.

The decision on which area gets cleaned up first will be made during the design process - with community input.

Comment #12: Several questions/comments were raised regarding the flow of traffic into and out of the community including the resident's accessability to their community, as well as the amount of truck traffic that is planned for construction activities. Specific questions/comments were: the possibility of closing roads in the community will restrict access to the development - there would be no way for residents or emergency services to get in or out of the development; how many dump trucks will it take to remove 44,000 cubic yards of material?

EPA Response: The remedy would be designed to keep access to the Claremont Development open at all times. The construction activities would be designed to limit the restriction of traffic flow and avoid a complete road closure. However, should it become necessary to temporarily close a portion of a road to carry out remedial activities, detours would be provided that allow access to the development. In the event that detours become necessary, emergency services and residents in the area would be informed of such detours before they would be implemented.

The number of dump trucks required to remove 44,000 cubic yards of material and backfill the excavated area with clean fill is estimated to be approximately 3,300 trucks. However, further consideration of roadway weight limits and traffic controls will be considered in the design and construction phases of the work to determine the number of trucks needed. In addition, traffic patterns used and the frequency of trucks entering and exiting the development will also be considered during design, with community input.

Comment #13: A number of questions were asked concerning the manner by which material would be transported out of the community during remedial construction activities: would the trucks be sealed; how would the trucks be loaded without getting the waste material on the tires and wheels and spreading it through the community?

EPA Response: All vehicles used to transport the waste material would be sealed before they leave the loading area and exit the development. Truck tires would be cleaned before leaving the loading area to prevent tracking the waste material through the development.

Comment#14: Several questions focused on the identity and number of remediation workers that would be used: are the remediation personnel federal workers or private contractors; how many workers would be used?

EPA Response: Cleanup work at Superfund sites is typically performed by private firms under contract with the government or

PRPs. The remediation workers at the Federal Creosote site would be employees of private firms that are specialized in remediation work. The number and type of workers required will vary during different phases of the work. Private contracting firms will recommend the number of employees needed to perform specific tasks which are subject to EPA or United States Army Corps of Engineers (USACE) approval. However, a remediation contractor has not been selected to undertake construction work at this time and, therefore, the number of workers required is not yet known.

Comment #15: What happens to fences, sheds, and pools in the back yards of properties where it is necessary to excavate canals or exit trenches?

EPA Response: If a shed can be moved out of the way of the excavation area without compromising its structural integrity, it would be moved. However, if the shed cannot be moved and replaced intact in its current condition, the structure would be demolished prior to excavation and be replaced after remediation work on that property is completed. In the case of fixed structures such as pools and fences that may be located in the area to be excavated, it is anticipated that such structures would be demolished and replaced.

Comment #16: One commenter stated that he had information that led him to believe that the cleanup of industrial sites takes precedent over the cleanup of residential sites. The same commenter also stated that he noticed in the Proposed Plan that parts of the Rustic Mall may be located over the canal area and asked if the cleanup of the Mall could be performed at the same time that cleanup of the Claremont Development takes place.

EPA Response: EPA response actions are designed to mitigate threats to human health and the environment regardless of whether such threats are located in a commercial or residential setting. In the case of the Federal Creosote site, EPA focused its investigation efforts in the residential community where the majority of the source material is located and, therefore, poses the greatest risks to human health and the environment.

EPA is aware of the potential for other source areas to be located beneath the Rustic Mall. As a result, EPA is currently investigating subsurface soils in the Mall. Should the need arise to cleanup portions of the Rustic Mall, EPA may be able to coordinate the cleanup of the Rustic Mall with the residential neighborhood.

Comment #17: Would EPA still remediate the canal and lagoon areas if a commercial development were to be built in place of the residential development?

EPA Response: EPA would remediate the canal and lagoon material if a commercial development were to be built in place of the residential development. The canal and lagoon material are the source of soil, groundwater, and possibly sediment contamination in the area. The source material within the lagoons and canals represents an uncontrolled release into the environment and, therefore, would be remediated irrespective of the future use of the land.

Comment #18: One commenter stated that the Proposed Plan was vague in terms of concrete specifications for the remedial action.

EPA Response: EPA seeks public comment to ensure that the criteria of community acceptance for a preferred remedy has been considered before EPA invests considerable resources in design of a remedy. The intent of the Proposed Plan is to provide the public an opportunity to comment on <u>what</u> EPA proposes to do at a site. The specifics of how the work will be performed is a component of design which usually begins only after community acceptance criteria is given consideration.

3. Health Concerns

Comment #19: One commenter asked what creosote does to the body.

EPA Response: Coal-tar creosote is a blend of over 200 compounds and approximately 85% of it is composed of polycyclic aromatic hydrocarbons (PAHs). Although no data exist which suggest PAHs are human carcinogens, some of the PAH components of creosote have been classified by EPA as probable human carcinogens. In studies conducted on animals, PAHs have been associated with certain types of cancers. Therefore, as part of its mission to protect public health, EPA assumes that PAHs may also cause certain types of cancer in humans. Certain non-cancer health effects have also been associated with exposure to PAHs and creosote. These include irritation of the respiratory tract and skin irritation.

Comment #20: Is anyone in danger of dying from the creosote? What is the mortality rate of living in the Claremont Development?

EPA response: No one can give a precise answer to the question of mortality. EPA evaluated the potential for current or future exposure to contaminated soil resulting in an increased risk of cancer and found a one in 10,000 chance of developing cancer during a lifetime of exposure to contaminated soils over a 30 year period for most of the residents in the community. When determining risk, EPA makes conservative assumptions about exposure to contaminants. For instance, it is assumed that people would ingest small amounts of soil every day for a period of 30 years. EPA combines that information with conservative assumptions about the toxicity of the chemicals that comprise creosote, which in this case, are predominantly PAHs. EPA is most concerned about PAHs, which have been demonstrated to cause some types of cancers in animal studies. Although PAHs have not been demonstrated to cause cancer in humans, EPA cautiously treats any chemical that causes cancer in animals as if it has the potential to be a human carcinogen. The risk assessment for the Federal Creosote site, therefore, takes a conservative approach to evaluate the reasonable maximum exposure to the soil and combines this with information on the toxicity of the PAHs to estimate the potential risks from exposure to contaminants in the soil by the residents of the Claremont Development.

Comment #21: A resident suggested that people with health concerns might want to get a blood test to give them peace of mind.

EPA response: Special tests are available which are able to detect PAHs attached to certain body tissues or in blood. These tests, however, are limited in that they cannot determine the extent or source of exposure or if health effects will occur due to exposure to PAHs. Since these tests require special equipment, they cannot usually be performed in all doctors' offices. The names of doctors who can perform these tests are available from the Agency for Toxic Substances and Disease Registry (ATSDR).

Comment #22: Some residents inquired if specific types of land use in the Claremont Development posed any threat to their health, specifically: is it safe to let small children play on this potentially hazardous soil; is it safe to eat the vegetables grown in my garden?

EPA response: A portion of the Claremont Development was part of the former drip area. In this area, treated lumber was left to drip and dry immediately after treatment. Creosote compounds were detected in surface soils at many properties in this area. Typical average exposures are not expected to contribute significantly to an increased risk. Because the subsurface soil investigation is not complete and a thorough risk assessment has not yet been conducted to determine what the potential risks are, activities with high exposures to the subsurface should be avoided. PAHs, which are the primary chemicals of concern at the site, are not readily bioaccumulated in vegetables, and, therefore, increased risks from exposure to home-grown vegetables are not expected. However, as a extra precaution, residents may consider a raised garden - bringing in a few inches of topsoil in which to plant vegetables.

Comment #23: A resident questioned whether the creosote components found in the Millstone River affect the Elizabethtown Public Water system, which uses the Millstone River as a source of public water supply.

EPA response: Samples of surface water and the sediment were taken from the Millstone River upstream of the public water supply intake. Creosote components were detected in the sediment of the river, however, no components of creosote were detected in the surface water. EPA has scheduled additional sampling of the surface water and sediment for this summer. In addition, the Elizabethtown Water Supply performs routine testing of the water on a regular basis to ensure the safety of the water supply.

Comment #24: A resident wanted to know why their development was on the National Priorities List (NPL) if the site does not pose an immediate or acute health threat. Several other residents made references to asbestos contamination from the Johns-Manville Company. They claimed that residents have been dying from asbestos exposure for 30 years and nobody did anything. They also said that asbestos from Gushers field has been contaminating the Raritan River for 50 years, and that Walmart was built on top of the asbestos-contaminated property. Their view is that people have lived in the Claremont Development for 35 years without incident, and for EPA to place the site on the NPL is overkill.

EPA Response: The Superfund Program is designed to investigate and clean up uncontrolled releases of hazardous substances into the environment. In the case of the Federal Creosote site, contamination was discovered in a residential area. It has been determined that the site does not pose an immediate health threat to the residents of the Claremont Development. However, the contamination is extensive, is uncontrolled, and has impacted sediment, soil, and groundwater in the area. Therefore, under the Superfund Program, EPA will continue to conduct investigations to determine the exact location and extent of the contamination, use established criteria for cleaning up the site, and identify cleanup alternatives for a long-term remedial action. By cleaning up the site through the selected interim action and this long-term action, EPA will protect human health by stopping or substantially reducing the release of hazardous substances to the environment.

4. Funding the Preferred Alternative

Comment #25: Several questions were raised concerning the funding of the project: is the cleanup being funded by the government; can funding be pulled from our site?

EPA Response: EPA has identified one viable potentially responsible party (PRP) for the Federal Creosote site. The PRP may be provided an opportunity to fund or undertake the work. Should the PRP elect not to fund or undertake the work, the work will be funded by the United States government and the State of New Jersey. In the latter case, ninety percent of the cost will be the paid by the federal government, and ten percent of the cost of the remedial action will be paid by the state.

5. Property Ownership Issues and Potential Liability to Homeowners

Comment #26: A question was raised concerning property deeds, particularly, if homeowners would have clean deeds at the completion of the remediation. There was concern expressed about what type of notation would be placed on the deeds to indicate that EPA had cleaned up their properties.

EPA response: At the conclusion of the cleanup, EPA will provide documentation to residents which states that properties were cleaned and that the homeowners have unrestricted use of their properties.

Comment #27: Should homeowners in the Claremont Development decide to sell their properties at any time after the cleanup, would there be any future liability to those selling their homes?

EPA response: EPA will not assign federal liability for cleanup actions to the homeowners of the Federal Creosote site, but can make no assurances about lawsuits from others. EPA will stay involved with the community after the cleanup to provide residents with any requests for documentation or information on behalf of prospective buyers.

B. WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD FROM THE POTENTIALLY RESPONSIBILITY PARTY

Comments and concerns which were not addressed at the public meeting were accepted in writing during the public comment period. Written comments that were received from Kerr-McGee, a potentially responsible party, appear in this section of the responsiveness summary, verbatim, in italicized print. These written comments are categorized by relevant topics and presented as follows:

1. Superfund Process
2. Health/Risk Characterization
3. Proposed Remedy
4. Relocation

1. Superfund Process

Comment #28: *The scope of the EPA's preferred alternative is not compatible with the definition of Operable Unit provided in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The Proposed Plan indicates that the cleanup strategy for the site is the first phase, or Operable Unit, and is considered to be an early action that only addresses cleanup of the highly contaminated source areas. The NCP defines an operable unit as a discrete action that comprises an incremental step toward comprehensively addressing site problems.*

The highly contaminated soils and sludges identified in canals A and B and lagoons A and B can reasonably be identified as source materials whose location satisfies the NCP definition of an operable unit. However, the $58,000,000 estimate for EPA's preferred alternative is not consistent with an action that is supposed to be a "discrete portion of the remedial response". For example, the average Superfund cleanup construction project cost is now $10,000,000. The current average reflects a decrease of $1.2 to $1.6 million per project over the last two years. Moreover, the Superfund Program was able to affect these savings while maintaining protective cleanups that continue to achieve the mandate for "permanence" and treatment of waste. The site is neither so complex, nor the exposure to hazardous substances so acute, as to warrant an expenditure of almost six times the current average.

If the EPA preferred remedy is not an operable unit, the EE/CA suggests it is a removal action. However, the estimated cost and duration of the EPA preferred remedy would also not justify it as a removal action under the NCP.

EPA response: The NCP states that an operable unit may address geographical portions of a site, specific site problems, or initial phases of an action, or may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of the site. EPA's decision to identify the lagoon and canal source material as an operable unit is consistent with the NCP definition of an operable unit, and is a discrete action comprising an incremental step toward comprehensively addressing site problems. The $59,100,000 estimate is specific only to OU1, a discrete portion of the remedial response, and is not applied to any other area of the site.

It is misleading to compare the cost of any one site to an "average cleanup" cost. The cost assumptions found in the remedial alternative cost estimate are set forth in detail in the EE/CA and rely, in part, on vendor submissions. In particular, the cost of treatment adds considerable expense because the source material is a RCRA listed waste which must be treated in accordance with RCRA land disposal restrictions.

Comment #29: *In light of the comment above, EPA should have gathered more information regarding the nature and extent of contamination, developed remedial alternatives that encompassed all the presumptive remedy options, and performed a more comparative analysis typical of a feasibility study. As explained later in this comment document, there exist other options, not considered by EPA, to accomplish the objectives set forth in the proposed plan for this operable unit for considerably less cost.*

EPA response: The EE/CA considered a number of remedial alternatives including in-situ treatment (i.e., slurry grouting, chemical grouting), off-site disposal, bioremediation, thermal desorption, and incineration. Analysis of these alternatives were provided in the EE/CA and is discussed in greater detail below.

Comment #30: *In opting for the permanent relocation at ten to nineteen residents, there was an obligation under the NCP to seek a cost-effective remedial action once the affected areas were vacated.*

The NCP provides for remedial action costs associated with the permanent relocation of residents. In doing so, it is presumed that relocation (either alone or in combination with other measures) is more "cost-effective" than, and environmentally preferable to, the secure disposition off-site of such hazardous substances that may otherwise be necessary for the protection of the public health or welfare.

Relocation of residents in this plan appears to be for practical purposes, i.e., to facilitate the excavation of the buried wastes as ATSDR has determined that there are no short-term exposure risks. However, if residents are relocated to facilitate cleanup, longer-term risks must also be reduced. This reduction in potential risks would suggest that the limitations to on-site, *in-situ or ex-situ remedial options, which were eliminated from consideration in the Proposed Plan would have been removed. Hence, on-site actions should be reasonably considered in conjunction with relocation. The plan should therefore evaluate both ex-situ and in-situ, on-site alternatives, because they would considerably reduce the remedial costs.*

EPA response: The scope of the permanent relocation is limited to properties that have structures located either above or adjacent to source material. The EE/CA considered on-site, in-situ and ex-situ remediation, however, the space provided by the permanent relocation of ten to nineteen properties is not contiguous and is limited to such an extent that these remedies could not be effectively implemented.

Comment #31: *The $58,000,000 preferred alternative identified in the Proposed Plan by EPA warrants a review by the National Remedy Review Board (NRRB).*

The EPA administrative memorandum announcing the formation of the NRRB anticipated that the board would conduct its review and make its recommendations on a preferred remedy before a proposed plan is issued for public comment. Moreover, the involvement of the NRRB was extended to the review of non-time critical removal actions, applying the same criteria and emphasizing that the review occur before the Engineering Evaluation/Cost Analysis (EE/CA) is issued for public comment.

There is no mention in the Proposed Plan that an NRRB review took place, or if it did, what the recommendations of the NRRB were.

EPA response: The preferred alternative was reviewed by the NRRB before the Proposed Plan and EE/CA were made available for public comment. The recommendations of the NRRB were included in the Administrative Record for the site. The Proposed Plan did not explicitly identify the NRRB recommendations, however, the NRRB recommendations were taken into consideration in the selection of the preferred alternative and are addressed in the Record of Decision.

Comment #32: *By conducting the Engineering Evaluation/Cost Analysis (EE/CA), EPA acknowledged that it could not take advantage of the generic justification provided by the "Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites."*

EPA has identified presumptive remedies for wood treater sites, which the agency believes represent appropriate response action alternatives. The actions identified in the presumptive remedy document are expected to be used except under unusual site-specific circumstances. Presumptive remedies are expected to save time and reduce costs and, therefore, generally should be used. EPA also acknowledged that it might be possible to accelerate remedy selection for non-presumptive technologies by performing a conventional Remedial Investigation and Feasibility Study (RI/FS) or EE/CA.

EPA response: An EE/CA may consider a broad range of remedial alternatives that EPA may consider as appropriate response actions. The bioremediation and thermal desorption technologies were considered in the EE/CA. The EE/CA presented rationale why these two technologies were not considered appropriate for on-site application and provided an analysis of each of these alternatives for off-site application. Many of the presumptive remedial approaches presuppose either the viability of on-site action or the availability of open land to perform treatment, neither of which are practical options in this neighborhood.

Comment #33: *EPA adopted presumptive remedial approaches to streamline and accelerate the remedy selection process. However, at the site, EPA still found it necessary to carry out an EE/CA to justify its remedy selection. Although the EE/CA did streamline the remedy selection process, the $58,000,000 cost for the remedy can hardly be viewed as a minimized cost. This is due largely to the fact that excluding the no action alternative, of the five remedial alternatives considered in the EE/CA, four were predicated on general response actions involving excavation and off-site disposal and treatment. Hence, the largest engineering cost component (excavation and off-site treatment and disposal), that represents in excess of 50% of the estimated remedial cost, was common to the majority of alternatives. As a result, the EE/CA was skewed in its evaluation. The EE/CA did not consider alternatives that employed bioremediation and/or thermal treatment, two additional technologies identified in the wood treater presumptive remedy document.*

EPA response: Remedial alternatives such as bioremediation and thermal treatment were given consideration in the EE/CA. The preferred alternative is thermal treatment of the source material. In weighing these remedial alternatives, consideration was given to a number of criteria that include compliance with ARARs and implementability. RCRA is a federal law that mandates procedures for treating, transporting, storing, and disposing of hazardous substances. To comply with RCRA, once the material is removed, it must be treated prior to disposal. This treatment may occur either on site, or if treated off site, the material must be handled at a RCRA-permitted facility. Space limitations at the site render on-site treatment alternatives unimplementable. No RCRA-permitted bioremediation facilities were identified in the EE/CA and, therefore, that alternative was not carried forward for additional consideration.

Comment #34: *The EE/CA was biased in its identification of remedial alternatives, even in identifying those that are consistent with presumptive remedies for wood treater sites.*

The EE/CA considered only certain alternatives relating to bioremediation, thermal desorption and incineration technologies, the identified presumptive remedies for wood treater sites. However, in deciding to conduct the EE/CA, EPA should have considered on-site, ex situ or in-situ bioremedial and/or thermal options that would achieve the stated objectives, particularly as such options become practical with resident relocation. Moreover, in-situ options are less likely to result in the magnitude of potential exposures to the community during excavation as compared to the EPA's preferred alternative.

EPA response: The EE/CA considered a wide range of alternatives: in-situ treatment, bioremediation, thermal desorption, incineration, and off site disposal. The lack of open land area within the development as well as the viability of performing an inherently industrial activity in a residential neighborhood were two issues identified in the EE/CA that led to the conclusion that on-site options for treatment and disposal of excavated materials were not implementable. In the event that it would become necessary to permanently relocate residents from nineteen properties, permanent relocation of residents at these properties would not provide enough space to make either bioremediation or thermal treatment alternatives practicable since the nineteen properties are not contiguous throughout the development. There are areas where relocation would occur on adjoining properties, however, this still does not provide adequate space for on-site treatment.

Comment #35: *On-site options, which are consistent with the presumptive remedies for wood treater sites, would be viable once residents are relocated.*

EPA response: As stated above, EPA disagrees with the assessment that on-site options would be viable once residents are

relocated. The permanent relocation of residents is limited to those areas where source material is located, and the remedy is
anticipates that the remaining home owners would not be relocated.

Comment #36: *The presumptive remedy guidance recognizes that, among other things, there may be significant advantages of innovative technologies over the presumptive remedies that warrant their consideration. To the extent in-situ application of one or more of the presumptive remedies would be considered innovative, the NCP expects EPA to consider an appropriate innovative technology. As indicated in EPA's Presumptive Remedy Policy and Procedures, presumptive remedies do not preclude the consideration of innovative technologies should the technologies be demonstrated to be as effective or superior to the presumptive remedies.*

EPA response: The NCP contains the expectation that EPA will consider the use of innovative technologies when such technologies offer the potential for superior implementability and fewer adverse impacts compared to other available approaches. On-site, in-situ technologies were given consideration in the EE/CA. They were considered to be unimplementable in a residential setting such as the Claremont Development and further would not provide a satisfactory degree of permanence as discussed further below.

Comment #37: *The only complete discussion of the balancing criteria, other than cost, appears for the first time in the Proposed Plan. Since the Proposed Plan only presented two remedial alternatives, one being No Action, other remedial alternatives, including those that should have been considered, did not benefit from this more detailed evaluation.*

EPA response: Remedial alternatives other than those discussed in the Proposed Plan were given consideration and evaluated in the EE/CA. Alternatives in the EE/CA were evaluated on the basis of balancing criteria, such as long-term effectiveness, short-term effectiveness, implementability, and the reduction of toxicity, mobility and volume through treatment. Since the source material to be addressed in OU1 is located within a residential community without adequate space, not all remedial alternatives considered in the EE/CA were carried through to the Proposed Plan, particularly remedial actions that would require locating objects such as an incinerator, thermal desorber, or a bioreactor in a densely-populated residential community.

Comment #38: *EPA's preferred remedial alternative was not* *compared to remedial alternatives that employed the other presumptive wood treater remedies, or remedial alternatives developed, using all of the balancing criteria, i.e., long-term effectiveness and permanence, reduction in toxicity, mobility and volume and short-term effectiveness, in addition to effectiveness, implementability and cost. These criteria, along with the other threshold criteria were only discussed in the Proposed Plan when the basis of comparison was only No Action. Therefore, the EPA's preferred remedial alternative was not afforded a full comparative analysis, which focuses on the relative performance of each considered alternative, as contemplated in the NCP.*

EPA response: Other presumptive wood treater remedies such as bioremediation, thermal desorption, immobilization, and incineration were considered in the EE/CA. Immobilization was not considered effective since it is better suited for inorganic contaminants. The contaminants at the site are organic compounds derived from creosote waste. As discussed earlier, bioremediation and thermal desorption were considered as on-site and off-site treatment alternatives in the EE/CA. Due to space limitations and the residential nature of the community, the on-site options of these alternatives were not carried forward for further analysis. Off-site options for these alternatives were also considered in the BE/CA, however, these options were not considered viable, due to the lack of facilities that are permitted to treat this RCRA-listed waste.

Comment #39: *The EE/CA should have considered waiving certain ARARs in light of the costs for the considered remedial alternatives.*

The Proposed Plan states that the material in the source areas is a listed RCRA-waste. Off-site treatment and disposal would therefore need to be performed at a RCRA-permitted facility. The EE/CA identified this issue as an ARAR, effectively eliminating any other off-site thermal treatment, except incineration, as an option because no such RCRA-permitted facility was identified. Consequently, the EPA's preferred remedial alternative adopts off-site thermal treatment by an incinerator.

Once again, the cost associated with the EPA's preferred remedial alternative ($58,000,000) should have triggered a more in-depth review of treatment options. Aside from the previously mentioned alternatives, which are consistent with presumptive remedy *guidance and more cost effective, the limited alternatives considered in the EE/CA could benefit from consideration of waiving this ARAR.*

According to the NCP, a remedy must satisfy the two threshold criteria, protection of human health and the environment and compliance with ARARs (unless a specific ARAR is waived). Although cost is not a factor in identification of ARARs, CERCLA authorizes the waiver of an ARAR with respect to a remedial alternative if any one of six bases exist. Specifically, cost may be a consideration when determining whether a waiver is justified for "technical impracticability", "equivalent level of performance", or "Fund-balancing".

A waiver for the ARAR associated with the EPA's preferred remedial alternative that prevents off-site treatment at a non-RCRA-permitted facility should have been evaluated based on "equivalent level of performance" or "Fund balancing".

While cost is not considered in evaluating equivalence, this waiver could provide cost-saving flexibility. Because the estimated cost for treatment and disposal is more than 50% of the total estimated preferred remedial alternative cost, less expensive technologies that can achieve the same outcome should have been explored before adopting a costly approach. Rejection of a comparable technology simply because of an action-specific ARAR is unjustifiable.

Since Fund monies are being expended for the preferred remedial alternative, consideration should have been given to invoking a Fund-balancing waiver with respect to the need for using an off-site RCRA-permitted facility for treatment. EPA's policy is to consider this waiver when the total cost of the remedy is greater than four times the national average cost of remediating an operable unit (currently 4 X $10,000,000 or $40,000,000). As the estimated cost for the preferred remedial alternative exceeds this threshold, a waiver may be warranted if this single site expenditure would place a disproportionate burden on the fund.

EPA response: The commenter states that EPA should have conducted a more in-depth review of treatment options. As stated in the ROD, EPA screened out other treatment options. The regulatory treatment requirement for this waste is the RCRA land disposal restrictions (LDR) and that rule requires meeting a treatment level for this waste using any available technology. On-site treatment is limited due to site-specific factors. Off-site permitted treatment is limited to thermal treatment.

The commenter also states that the Agency should have considered invoking the Fund-balancing waiver because of the need of using an off-site RCRA permitted facility for treatment. EPA selected off-site treatment because of site-specific constraints, not because of ARARs. ARAR waivers (in this case the Fund-balancing waiver) only have application to *on-site* remedies. The use of an ARAR waiver either through "technical impracticability," "equivalent level of performance," or "Fund-balancing" does not have relevance at this site because *off-site* treatment is the selected remedy.

Comment #40: *The administrative record was not readily available and is incomplete. The administrative record was not available at the EPA-Superfund Records Center in New York. The administrative record at the Manville Public Library is incomplete. For example, it does not include information such as the raw analytical data, the QA/QC packages and the boring logs. We reserve the right to review this data and comment further at a later date.*

EPA response: The administrative record was available at the EPA-Superfund Records Center in New York during the public comment period. The administrative record was also available at the Manville Public Library. The administrative record included boring logs of sample points. This information may be found in the Environmental Response Team Report titled "Technical Memorandum - Site Investigation Report", November 30, 1998. This report also provided data summary tables of all samples taken during ERT's investigation of the lagoon and canal areas. However, because of the voluminous nature of the documentation that supports the data tables in the ERT report, e.g., QA/QC data validation packages and raw data sheets, such documentation was not included in the administrative record. This "raw data" is typically not made part of administrative records. However, EPA has made this information available to the interested party and extended the public comment period to provide the party a reasonable opportunity to comment on that information in addition to the administrative record.

2. Health/Risk Characterization:

Comment #41: *The distribution of PAH congeners does not resemble other wood treating sites, and the assessment of potential risks may therefore need to be reevaluated. Virtually every polycyclic* *aromatic hydrocarbon (PAH) was detected at the site, including all species of carcinogenic PAHs (cPAHs). Unusually, however, benzo(a)pyrene (BaP) is consistently present as 60% of the total cPAH risk. Normally, BaP is a minor constituent. The EPA should make sure that a QA/QC check has been done to insure that BaP (and other PAHs) are being identified correctly. Alternatively, the risk assessment performed by CDM Federal Programs may have incorrectly assumed a log normal distribution for the contaminants. Evidence should be provided to support the use of a log normalcy assumption. Finally, CDM Federal Programs generally substituted one-half the detection limit for non-detects. In a small censured data set, this substitution may be inappropriate and may have contributed to the unusual distribution of PAHs observed.*

EPA response: All data used to characterize risk at the site have been reviewed using appropriate Quality Assurance/Quality Control procedures as required by the CLP protocol. This includes analyzing calibration verification standards, matrix spike/matrix spike duplicate samples, and method blanks at the appropriate frequency to ensure that the analytical results meet the highest level of QA/QC standards so that results reflect a positive presence of the contaminant in samples, where present, as well as accurate and precise concentrations. All analytical data which are used in the risk assessment must meet the QA/QC standards required by the CLP protocol.

The comment also states that benzo[a]pyrene (BaP) contributes up to 60% of the risk from carcinogenic PAHs. It should be noted that potential risk from exposure to carcinogenic PAHs (cPAHs) was estimated using the Relative Potency Factor approach. As per EPA guidance, cPAHs are evaluated based on their individual toxicity relative to BaP. In this method, the relative potencies of BaP and dibenz[ah]anthracene are 1.0, while the relative potencies of all other cPAHs have been set at values which are orders of magnitude less than 1.0. Using this approach, it is likely that BaP would contribute a significant portion to the cumulative risk associated with cPAHs, even when the concentration of BaP is consistent with other cPAHs.

The risk assessment did assume the data for each property were lognormally distributed. This assumption is based on two important pieces of information. First, approximately 10 to 12 surface soil samples were collected at each residence. These data sets are too small to statistically determine if the contamination is normally or lognormally distributed. Second, EPA guidance ("Supplemental Guidance to RAGS: Calculating the Concentration Term" OSWER; Publication 9285.7-08I) states that it is reasonable to assume that data from soil samples are lognormally distributed. This assumption is based on review of many soil sample data sets for Superfund sites which show that the data are lognormally distributed.

Actual constituent concentrations were used to develop the exposure point concentrations used in the risk assessment. Consistent with current EPA guidance (RAGS Volume I: Human Health Evaluation Manual [Part A] Interim Final [OSWER; EPA/540/1-89/002]), when results were reported as non-detects, one-half of the reported detection limit was used to develop the exposure point concentration.

Comment #42: *The site at present does not present unacceptable exposure risks. Although potential carcinogenic risk exists at depth and, at least upon two occasions; apparent creosote tars have come bubbling up to the surface, there is no fate and transport analysis as to whether further excursions of impacted materials to the surface are likely to occur. ATSDR has concluded that the site does not present an unacceptable public health risk at present, which conclusion is at odds with EPA's preferred alternative (i.e., if current risks are acceptable an extensive high cost remedy with significant short-term risks may not be warranted).*

EPA response: PAHs associated with creosote are the main contaminants of concern at the site. Samples taken from the site were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals. Among the SVOCs analyzed were 23 PAH compounds, seven of which are classified as probable human carcinogens. Historically, PAH compounds have been reported in several ways, including total PAH concentration (TPAH), total carcinogenic PAH concentrations (CPAH), and benzo[a]pyrene equivalents (BAP). TPAH is the sum of all PAH concentrations in a sample and is always greater than or equal to CPAH, which is the sum of the portion of PAHs classified by EPA as carcinogenic. BAP is a weighted concentration based on the individual carcinogenic PAHs and can be used to assess the carcinogenicity of CPAH in terms of benzo[a]pyrene, which is a carcinogenic PAH that has been extensively studied.

Data from the site indicate that the ground water, a source of drinking water, is contaminated with creosote from the lagoons. In addition, creosote was observed being discharged from a sump in a residence on Valerie Drive into the street. PAHs, due to their highly toxic and highly mobile nature at this site, are considered a principal threat. For these reasons, action is needed to address the principal threat source material in the lagoon areas.

Although the quantitative risk assessment for the subsurface soils has not yet been completed, site information indicates that an *early interim* action is needed quickly to prevent further environmental degradation and achieve a reduction in risk while a final remedial solution is being developed. Samples from the lagoon areas show that the concentrations of PAHs in Lagoon A were as high as 1,862 ppm, and PAHs in Lagoon B were found to be as high as 2,548 ppm (as BAP equivalents). Under a direct contact residential scenario, PAH concentrations that are above 9 ppm (BAP equivalents) exceed a 10-4 risk and indicate the need for action.

The more specific findings of the soil baseline risk assessment and the ultimate cleanup objectives for the site will be included in a subsequent ROD for the site.

Comment #43: *Risks to the community will be exacerbated through execution of the preferred remedial alternative. As noted in EPA's emergency listing, there are no unacceptable public health risks at present. However, the proposed excavation and hauling off-site of over 44,000 cubic yards of contaminated soil will present considerable public health risk. Increased exposures from EPA's preferred remedial alternative include: mobilization of creosote tar components into groundwater and air (both vapors and dust), and contamination of adjacent commercial and residential properties, and risks to community residents from heavy-duty vehicular traffic. Concerning the latter, it should be noted that the Claremont Development has limited access at present, which access would be further limited by excavation activities and increased truck traffic at entry ways. In contrast to EPA's preferred remedy, various in-situ remedial alternatives will minimize potential exposures to contaminants, vehicular traffic and public health risks, although these technologies may require limited evacuation of some Claremont residents.*

EPA response: Evaluation of the short-term effectiveness criterion considered the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved. Mitigation of dust and odors can be achieved by such engineering controls ranging from the use of wetting agents to prefabricated structures during remedial activities at the site.

Mobilization of creosote tar components in the groundwater is a concern. Groundwater sample results indicate that the creosote tar components are mobile and are present in the groundwater. It is the objective of the remedial action to reduce or eliminate the mobility of the contamination at the site. Engineering controls will be used to ensure that the response action does not increase the mobility of the source material.

EPA acknowledges that access to the Claremont Development is limited and will design the response action such that access to the Claremont Development is unimpeded.

As mentioned in previous responses, in-situ remedial alternatives were given consideration in the EE/CA and found not to be implementable.

Comment #44: *The Proposed Plan fails to indicate what the estimated potential risks were for the two apparent excursions of creosote tars to the surface. Both EPA default and revised cancer risk guidelines should be used to complete the analysis. The analysis should consider the short-term nature of the potential exposures, the actual constituent concentrations in the material encountered, and the fact that these two excursions represent the only known potential exposures over the 50+ years that the materials have been at the site.*

EPA response: The response to comment #42 addresses this comment.

Comment #45: *The site should be characterized more completely concerning potential exposure pathways. The site characterization as presented in the Proposed Plan appears incomplete, especially concerning physical parameters of the subsurface. A more complete description of physical properties of creosote tars and hydrogeology are required to predict future fate and transport of tar constituents, for accurate predictive risk assessment and prior to implementation of any in-situ or ex-situ treatment technologies. Critical issues which must be examined and resolved prior to any fate and transport analysis, risk assessment or remedy implementation include:*

- *The mobility of creosote tars in the canal and lagoon areas;*
- *The consistency (viscosity) of these tars as compared to other viscous substances such as asphalt, molasses, heavy oil or light oil;*
- *The melting point and high temperature water solubility of tar constituents;*
- *The water solubility of tar constituents under ambient conditions;*

- *The composition of subsurface soil with respect to granularity, carbon and clay content, an permeability;*
- *Whether creosote tars exist within both saturated and unsaturated zones; and*
- *Potential mobilization conduits created by sewer, optical cable and other lines which transect the site.*

Resolution of these critical issues will have a direct impact on the design and construction of the preferred remedial alternative. Moreover, the potential adverse effects from such data gaps can cause schedule slippage and cost overruns during the design and construction phases of remedy implementation.

EPA response: EPA believes adequate data has been collected in order to select a remedy. As reported in the ERT Technical Memorandum - Site Investigation, the material found in the lagoons is a sludge like material which has been found in both the unsaturated and saturated zones. The material found in the shallow portions of the canals is a drier material, however, in some of the deeper areas of the canals this material has been determined to be a sludge like material. Further sampling is being conducted to determine the pathways that the material may have taken. Additional sampling to fill in the data gaps identified in the comment will be performed in the design phase of the project.

Comment #46: *In-situ remedial alternatives exist which will minimize future risks. As noted above, excavation and removal actions will exacerbate public health risks. In-situ technologies exist, however, which will alleviate future potential migration of creosote tars to the surface. While some of these might entail partial or temporary complete evacuation, these will prove less disruptive, safer and less costly than the proposed remedy. Ostensibly, if an in situ alternative remedy requires no excavation, no homes would need to be destroyed. if relocation is for a longer term, a viable sub-option, from a risk perspective, would be to buy all affected homes and, following remediation, sell these homes back to the community.*

EPA response: Engineering controls can be put in place to mitigate
short-term public health risks during the implementation of the preferred remedy. As discussed earlier, in-situ remedial alternatives were considered in the EE/CA and were considered impracticable. Temporary or permanent relocation of all residents in the development is far more disruptive to the

community than the more limited relocation arrangement provided in the preferred alternative. EPA's preference, as presented in the Interim Policy on the Use of Permanent Relocations as Part of Superfund Remedial Actions (June 30, 1999 OSWER Directive 9355.071P), is to address the risks posed by the contamination by using well-designed methods of cleanup which allow people to remain safely in their homes and businesses. Consistent with this guidance, EPA will limit permanent relocations to structures that are an impediment to implementing a protective cleanup.

3. Proposed Remedy:

Comment #47: *It is premature to evaluate and select a preferred remedial alternative for this site until after the investigation and delineation activities are completed. Based on the significant uncertainties regarding the extent and volume of impacted materials to be remediated, it is premature to complete the evaluation and selection of a remedial option for the site. As presented in the Proposed Plan, the volume of impacted materials requiring remediation "may change substantially pending a review of the subsurface data". Such changes could dramatically impact the number of houses to be relocated, the number of affected residents, the total costs and risks of various alternatives, and the overall comparison of options. Because the ATSDR evaluation has indicated that there are no unacceptable short-term risks, and because the waste has been present for at least 40 years, it would be appropriate to wait until the site investigation and evaluation activities are completed prior to the final evaluation and selection of a preferred remedy.*

EPA response: EPA plans to implement the selected remedy in a phased manner and will be initially moving forward with the relocation of affected residents. However, the agency does not plan to begin the actual removal of the source area contamination until the site-wide RI/FS is completed. EPA believes that the full extent of contamination within the development should be known prior to the initiation of intrusive cleanup activities. As indicated previously, the available data indicate that 32 residential properties need to be remediated, ten to nineteen of which will require the permanent relocation of the residents. Based on this data, EPA believes that excavation and off-site thermal treatment of the lagoon and canal wastes, while maintaining the existing nature and character of the development, is the appropriate remedy for the site. If, however, the ongoing investigation of the remaining 105 properties in the development reveals extensive contamination necessitating the purchase of a significant number of additional properties, EPA may reconsider that portion of the proposed remedy dealing with the source areas. Any such change would be subject to full public input and comment.

Comment #48: *The EPA's proposed remedy should be reconsidered because the actual remediation costs may greatly exceed the $58,000,000 estimate for the preferred alternative presented in the Proposed Plan. A number of factors including a potentially larger waste volume, potentially underestimated unit costs, and potentially omitted remediation activities could cause the EPA's preferred remedy to cost much more than the $58 million presented in the Proposed Plan. As a result, the evaluation and comparison of remedial alternatives is a flawed basis for selection of a preferred remedy.*

As presented in the Proposed Plan, all soils "exhibiting signs of visible contamination" would be removed under the preferred remedy. Further, the Proposed Plan states that the estimated volume of impacted soils upon which the evaluation was based "may change substantially pending a review of the subsurface data". This lack of data presents a significant concern with regards to the evaluation of remedial options because even a small change in the volume of soil to be removed could have a profound impact on the overall cost of the remediation since more than 50 percent of the remedial cost is for excavation, treatment and disposal. For example, considering the difficulties likely to be encountered during the excavation, and potential over-excavation as a result of visual staining and field decisions, removal of as little as 5 feet of additional soil from each boundary of Lagoons and Canals A and B would result in a 30 percent increase in the volume of soil excavated. This would increase the overall cost by approximately $8 million. If chemical testing is used to define the limits of excavation, cost increases much greater than 30 percent could easily result. Costs could therefore easily increase to beyond $100 million. Such a potential cost increase warrants a re-evaluation of the remedial alternatives and preferred remedy.

The unit costs for off-site transportation and incineration may be underestimated, and are therefore not a reasonable basis for the evaluation and selection of a preferred remedy. For example, recent vendor quotes put the cost of incineration alone (without transportation and associated costs) at $700 to over $1,000 per ton of material, as opposed to the $510 per ton assumed in the

EE/CA (see Appendix III). Published remediation cost data also reflect a cost of over $1,000 per ton for the incineration of bulk solid wastes. Based on the estimated 60,000 tons of material to be incinerated, every $100 extra per ton would increase the total remediation costs by $6 million. Based on a transportation and incineration cost of $1,000, the total remediation cost could approach $30 million more than estimated in the EE/CA.

A detailed evaluation of the EE/CA also indicates that costs for items such as perimeter air monitoring for community protection and related required activities have not been adequately reflected in the estimated costs presented in the Proposed Plan.

EPA response: Cost estimates in the EE/CA are based on quotes from vendors and are considered adequate. Contingency factors have been built into the estimates to take into account variability in costs and uncertainties in volume estimates.

EPA is aware of the uncertainty of the scope of the cleanup and has addressed this issue in its response to earlier comments.

Comment #49: *The $58 million preferred alternative identified by EPA in the Proposed Plan presents potentially significant implementation problems and short-term risks that have not been adequately evaluated in the Proposed Plan.*

The analysis of the EPA's preferred remedy presented in the Proposed Plan underestimates the potential implementation problems and short-term risks associated with the excavation and off-site incineration of the impacted soils, and therefore is not an appropriate basis for the selection of a remedy. For example, the actual volume and locations of material to be excavated have not been fully defined, and "may change substantially pending a review of the subsurface data". As a result, implementation concerns associated with the total area of disturbance, volume of material to be handled, and number of affected properties and house to be demolished have not been adequately characterized.

Further, the Proposed Plan states that the EPA's preferred alternative (excavation and off-site disposal) would eliminate the potential exposure of residents to contaminated soils, and there would be no local human health impacts. However, based on the estimated excavation mass of greater that 66,000 tons, and *assuming a standard truck size of approximately 20 tons, the EPA's preferred remedy would require more than 3,300 additional trucks to and from the site. This additional traffic presents potentially significant risks to the public as a result of traffic accidents, spills, releases, etc. Also, the significant exposure and handling of impacted soils increases potential exposure risks as compared to the current conditions where the materials are generally separated for the community by existing cover soils.*

Finally, the EE/CA and Proposed Plan do not adequately reflect the potential implementation concerns and short-term risks associated with the control of fugitive emissions. As a result, the EPA's preferred remedy likely presents greater short-term risks than reflected in the Proposed Plan. The EE/CA and Proposed Plan rely on the use of a pre-fabricated enclosure for the control of fugitive emissions. However, based on the location of the impacted soils to be excavated, and the structures schedule to remain in place, there is not enough room to erect an enclosure over all excavation areas, and therefore, fugitive emissions are a potential concern. Also, and as discussed in related EPA technical documents, short-term risks to workers working within an enclosure can be significant as a result of hazardous air concentrations within the enclosure, significant personal protective equipment (PPE) required, the potential for PPE failure, and significant physical hazards associated with the confined working conditions and poor visibility.

EPA response: Implementability and short-term effectiveness criteria have been identified and have been evaluated in the EE/CA and the Proposed Plan. The EE/CA considered using a pre-fabricated structure (PFS) to control dust and odor during excavation. The EE/CA recognized that there will be some areas where use of a PFS may not be practicable. In such instances, other engineering controls such as wetting agents could be used.

EPA acknowledges the uncertainties identified with regard to the volume estimate of source material, and has responded to this issue already.

Potential short-term risks to hazardous waste site remediation workers is inherent in the hazardous remediation field. However such risks can be managed to ensure the safety of site workers. Engineering controls to maximize worker safety will be given consideration during design.

Comment #50: *The remedy evaluation and selection process failed to adequately consider alternate in-situ remedial approaches that could be more cost-effective than the preferred alternative identified in the Proposed Plan. The EE/CA considered only one in-situ treatment alternative (in-situ immobilization).*

Bioremediation is an applicable remedy identified in the EPA wood treaters presumptive remedy guidance document. Both ex-situ and in-situ bioremedial remedies have been identified, screened and selected as the preferred remedy at wood treater sites. As presented in EPA's wood treaters presumptive remedy guidance, of the 18 RODs where bioremediation was considered, it was selected as the preferred remedy in 9 RODs (as comparison, off-site incineration was selected at only 4 of the 26 sites where incineration was considered). Considering the residential nature of the site, use of in-situ bioremediation would maintain the integrity of the community while reducing the overall risks to the residents. Although bioremediation of the site may require a longer period to reach target levels, the ATSDR evaluation has indicated that there are no acute short-term risks, therefore, a longer remedial program could effectively be implemented. EPA technology documents present a potential cost range of $50 to $250 per cubic yard for the successful biological treatment of creosote- contaminated soils and wastes, which would result in significantly lower remediation costs that presented by the preferred remedy.

In-situ thermal desorption is another potentially cost-effective remedial measure that was not considered in the EE/CA or the Proposed Plan. This process uses thermal wells and/or thermal blankets to remove constituents. In-situ, where they are collected and destroyed at the surface. This remedial approach has been effective at manufactured gas plant sites and other sites with creosote-type wastes. By leaving the wastes in situ, the significant implementation concerns associated with excavation and off-site incineration (e.g., short-term exposure risks, house demolition, disruption of the entire community, increase truck traffic, fugitive emission controls, excavation below the water table, etc.) are eliminated. Further, this process can be implemented in a relatively short time period, and estimated costs for this alternative ($50 to $150 per ton) are significantly lower than costs for off-site incineration.

Related technologies that are also potentially applicable to this site include in-situ thermal methods that involve steam and oxygen injection such as the hydrous pyrolysis/oxidation (HPO) process. HPO has been demonstrated to be successful at the Visalia Commercial Creosote Site in Visalia, California.

Phytoremediation, i.e., the use of plant for remediation has gained acceptance in the past 2 to 4 years and has been demonstrated effective as; alternative caps for waste site closure, groundwater treatment systems and cleanup agents. Plant species tolerant to wood treater wastes such as perennial rye grasses have passed greenhouse treatability studies at a wood treatment site in Portland Oregon. The site has been seeded and studies indicated that significant contaminant degradation in shallow soil should occur in two growing seasons. Mulberry and hackberry trees have been used by Union Carbide to provide a closure for a former impoundment containing highly toxic sludge with the consistency of axle grease that contained PAHs and other mixed wastes. The vegetative cover has lowered the water-table in the former impoundment, preventing contaminant leaching to groundwater and excavation of the site has revealed that the upper portions (up to 40-inches) of the basin looks like top soil and no longer has a chemical odor. Chemical testing of shallow soil samples indicated low PAH concentrations. Although phytoremediation was not identified as a presumptive remedy by the EPA, recent demonstrations suggest that this technology could be applicable to the site, especially to remediate the shallow PAH-impacted soil. This technology should be evaluated in light of the $58 million cost associated with the preferred remedy.

EPA response: Concerns relating to the technical feasibility of treating site soils using bioremediation exist. Studies on the bioremediation of creosote-contaminated soils indicate that 2-, 3-, 4-ring compounds can be biodegraded effectively, but 5-and 6 ring compounds are generally not degraded as easily. As a result, treatment criteria for some PAHs may not be attainable or may take long periods of time to achieve. Also, soils with high levels of concentrated residual creosote typically are not amenable to treatment using bioremediation.

Based on EPA's experience and its scientific and engineering evaluation of alternative technologies, presumptive remedies are preferred technologies for common categories of sites, such as wood treater sites. The objective of the presumptive remedies initiative is to use Superfund program's experience to streamline site characterization and speed up the selection of cleanup actions. EPA has the expectation that presumptive remedies will be used at all appropriate sites except under unusual site-specific circumstances. In-situ thermal treatment technologies are not presumptive remedies for wood treater sites. In-situ thermal treatment technologies introduce uncertainties that are either eliminated or greatly reduced by presumptive remedies for wood treater sites. The time it takes to remove the material from the subsurface and the ability to remove all the source material are uncertainties associated with in-situ thermal treatment technologies. In addition, impact to underground utilities (i.e., fiber optic cables, natural gas lines) present additional concerns regarding this technology's application within a residential community. Furthermore, the ability to capture off-gases is uncertain and such a long-term, on-site treatment plant required to control and treat such off-gases produced by these technologies is not appropriate within a residential community.

The comment points out that phytoremediation may be effective in reducing PAH concentrations in shallow soils. The contaminant reduction that can be achieved by this technology is not widely documented. Considering the general transport properties of target contaminants (high organic carbon partition coefficient, low solubility), which would limit dissolved contaminant concentration in soil moisture, it is unlikely that the cleanup goals could be achieved by this technology. In addition, it is expected that the depth of the root-bearing zone for trees/shrubs (e.g. mulberry and hackberry trees) would be no more than three feet following planting. Grasses (e.g. perennial rye grass), which already exist on contaminated properties, would only address surface soils. By contrast, the PAH contamination within the Claremont Development extends to a depth of 20 feet and is too deep to consider phytoremediaiton a viable alternative.

Comment #51: *The remedy evaluation and selection process failed to adequately consider alternate on-site, ex-situ remedial approaches that could be more cost-effective than the preferred alternative identified in the Proposed Plan. The EE/CA considered only a limited number of on-site ex-situ treatment alternatives, and there were generally all eliminated because of the residential nature of the area and a lack of space. However, if houses were to be demolished and relocated (as would be the case for the preferred remedy), significant space could be made available, and such a process could be less disruptive to the community by reducing truck traffic, and could be completed for a much reduced overall project cost. As a result, the EPA's preferred remedy should be reconsidered in light of the potentially effective on-site, ex-situ remediation approaches available.*

Ex-situ remediation approaches that could be conducted on-site and that have been successfully utilized at other creosote sites include bioremediation, thermal desorption, asphalt batching, and soil washing. Although some excavated materials may be classified as a hazardous waste, the EPA could designate the excavation/backfill area and the ex-situ treatment unit as part of a Corrective Action Management Unit (CAMU), and Land Disposal Restriction (LDRs) and Universal Treatment Standards (UTSs) would not be triggered, and the alternative could satisfy all ARARs. As presented in EPA's Presumptive Remedies for Soils, Sediments, and Sludges a Wood Treater Sites, ex situ bioremediation and ex-situ soil washing were two of the most commonly selected remedies present in RODs for creosote sites. Estimated costs for ex-situ biological treatment remedies are approximately $50 to $150 per cubic yard of material, which are far less than the costs for excavation and off-site incineration. Estimated costs for on-site thermal desorption are approximately $100 to $200 per cubic yard, which are also far less than excavation and off-site incineration.

With regard to the space limitations stated in the Proposed Plan for such on-site, ex-situ remedies, sufficient space would be made available by the removal of houses as currently proposed by the EPA. For example, a typical thermal desorption unit and associated equipment can be laid out in an area of approximately 120 feet by 120 feet, which would only occupy approximately two properties if located on-site (10 to 19 properties are considered in the Proposed Plan for permanent relocation).

The Proposed Plan also indicated that on-site, ex-situ remedies were eliminated from consideration given the residential nature of the area. This reason is considered to be invalid because the community disruption that would be associated with on-site, ex-situ treatment is insignificant as compared to the site disturbance associated with implementation of the preferred remedy (e.g., resident relocation, house demolition, site-wide excavation, emission control structures, truck traffic, etc.)

Given the lack of consideration in the EE/CA, the proven acceptability, effectiveness, and low cost of on-site, ex-situ remedies for other creosote-contaminated sites, and the actual availability of the required space for such processes, these options should be fully reconsidered prior to the selection of a *preferred remedy.*

EPA response: EPA gave consideration to on-site alternatives in the EE/CA. As pointed out previously, the demolition of houses in the preferred alternative is generally limited to properties that either have source material beneath or adjoining structures. The space made available by such demolition is not adequate for on-site treatment alternatives proposed in previous comments because the space created by such demolition is insufficient to accommodate the facilities required for the treatment of the volume of source material. Although thermal desorption units exist that may be laid out in an area approximately 120 feet by 120 feet, the capacity of such a plant would be restricted to such an extent that the time period of operation would be more extensive than excavating and removing the material off-site for treatment and disposal. In addition, the suggested plan would require the construction of a treatment plant on one lagoon, treating the waste from the other lagoon, then dismantling the plant and mobilizing again at the other lagoon. Off-site treatment and disposal would have the space needed to stage larger amounts of material before treatment which allows for faster excavation and removal of material from the residential community. Moreover, trucking of material through the community to an on-site treatment facility would not be eliminated and would result in a full scale hazardous waste treatment plant within the confines of a residential community.

The comment states that the Proposed Plan indicates that on-site, ex-situ remedies were eliminated from consideration given the residential nature of the area. The comment claims this reason is invalid because the community disruption that would be associated with on-site, ex-situ treatment is insignificant as compared to the site disturbance associated with implementation of the preferred remedy (e.g., resident relocation, house demolition, site-wide excavation, emission control structures, truck traffic, etc.). Any on-site, ex-situ treatment would require two general components: excavation of the source material and treatment of the source material on site. Since excavation is a component of the on-site ex-situ treatment alternative, such a remedy would also necessitate resident relocation, house demolition, and emission control, etc. In comparison, however, the preferred alternative is less disruptive to the community because it involves only one general component - the excavation of material and does not include treatment on site.

Comment #52: *The remedy evaluation and selection process failed to adequately consider alternate off-site, ex-situ remedial approaches that could be more cost-effective than the preferred alternative identified in the Proposed Plan.*

Because the remedy evaluation and selection process failed to adequately consider alternate off-site, ex situ remedial approaches that could be more cost-effective than the EPA's preferred alternative identified in the Proposed Plan, the evaluation and selection of a preferred remedy is based on flawed analysis.

The Proposed Plan states that "incineration is believed to be the only available option for off-site treatment" because of the absence of other facilities permitted to accept RCRA-hazardous wastes. However, a review of available facilities indicates that permitted, off-site thermal desorption units exist in New Jersey which could potentially accept the materials, and the materials could also potentially be sent to a recycling facility for incorporation in asphalt (as was done for the creosote-impacted materials a the Utah Power & Light/American Barrel Superfund Site in Salt Lake City, Utah). Landfills and related facilities in Canada which should accept the materials have also been identified. Such facilities present potentially significant cost savings as compared to off-site incineration (costs $40 to $150 per ton as compared to $700 to $1,000 for incineration), and the lack of consideration of such facilities reflects the incomplete nature of the identification and evaluation of potential remedial options. Because of the significant cost savings potentially afforded by such facilities, any remedial options involving off-site disposal of excavated materials should re-consider the available alternatives to off-site incineration.

EPA response: In the case of the Utah Power & Light/American Barrel Superfund Site, only creosote-impacted soils were allowed to be sent to a recycling facility for incorporation into asphalt. The ROD for that site included the provision that RCRA wastes would not be used in the asphalt treatment process and would be shipped off site for incineration.

EPA is aware that thermal desorption units exist in New Jersey that have the potential to treat wastes from the site, however, no thermal treatment facility in New Jersey is permitted to treat RCRA F034 listed waste at this time. EPA is also aware that one facility has considered applying for a permit to treat F034 listed waste. Should a thermal treatment facility become permitted to treat F034 listed waste, EPA will consider sending the source material to such a facility. Consistent with this approach, EPA has modified its definition of thermal treatment in this ROD to include thermal desorption or incineration to provide flexibility in treating the waste material.

Comment #53: *The remedy evaluation and selection process failed to adequately consider alternate on-site containment remedial approaches that could be more cost-effective than the preferred alternative identified in the Proposed Plan.*

The Proposed Plan indicates that containment options were eliminated from consideration as a result of uncertainties associated with containment and EPA's determination that the canal and lagoon areas comprise principal threat wastes. However, containment options are among the most common, proven and reliable remediation approaches, and EPA guidance states that the treatment of principal threat materials should not be conducted if implementation of the remedy would result in greater overall risk to workers or the surrounding community during implementation. Because the EPA's preferred alternative likely increases short-term exposure risks, and because current risks were determined by the ATSDR to be acceptable, other options such as containment should be reconsidered (consistent with the EPA's Principal Threat Guidance) prior to the selection of a remedy for the site. For example, traditional containment measures such as capping, vertical barrier walls (a.k.a., slurry walls), and groundwater pump and treat could result in much reduced short-term risks, lower impacts to the community, and lower costs. If it is assumed that houses are to be removed and relocated as would be done for the preferred remedy in the proposed plan, significant containment and redevelopment options (e.g., for industrial or commercial uses) exist that were not identified or evaluated in the EE/CA or Proposed Plan. Even if all the houses required removal and/or relocation to facilitate implementation of a protective remedy for the site (i.e., groundwater recovery and treatment, asphalt capping, and commercial/industrial redevelopment), estimated costs for such a remedy would be significantly less than those for the preferred remedy. Similarly, the industrial/commercial redevelopment of this site would be consistent with EPA and New Jersey initiatives and regulations regarding the appropriate and risk-based redevelopment of contaminated properties. As a result of the omissions in EPA's evaluation, the remedy evaluation and selection process needs to be reconducted prior to the designation of a preferred remedy.

EPA response: EPA's risk analysis concluded that health risks at the site exceed EPA's acceptable risk range. Engineering controls will be used during implementation of the preferred remedy that will minimize short-term health risks. Since a health risk exceeding EPA's acceptable risk range exists at the site, and engineering controls will minimize short-term risks, it is not anticipated that implementation of the preferred remedy would result in greater overall risk to the community.

The comment also claims that significant containment options were not considered in the EE/CA. The EE/CA did consider five different grouting techniques, and six different types of chemical grouting as containment options. These were not carried forward due to the uncertainties associated with the technologies at this site. Furthermore, containment does not meet the NCP expectation that treatment be used to address the principal threat wastes posed by a site. Engineering controls, such as containment, would be more appropriate for low-level threat wastes that present only a low risk in the event of release. In contrast, the source material is considered to be toxic and mobile; it cannot be reliably contained, and would present a significant risk to human health or the environment should exposure occur. This precludes containment as a remedy for the source materials regardless of future land use. In addition, EPA's preference (Interim Policy on the Use of Permanent Relocations as Part of Superfund Remedial Actions, June 30, 1999, OSWER Directive 9355.0-71P) is to address the risks posed by the contamination by using methods of cleanup which allow people to remain safely in their homes and businesses.

Comment #54: *The EPA Proposed Plan is premature in the absence of a completed site-wide, Remedial Investigation and Feasibility Study (RI/FS). The EPA Proposed Plan is premature, particularly in light of the fact that environmental data are still being developed as part of an ongoing RI/FS. Hence, it is inappropriate to move forward with the preferred alternative in the EPA Proposed Plan until a full comparative analysis of remedial alternatives, as contemplated in the NCP, is completed.*

This contention is supported by the NRRB as stated in the memorandum found in the administrative record in EPA's Region 2 office. The NRRB states that the EPA Proposed Plan considered only a single cleanup alternative; it emphasizes the need to complete a site-wide RI/FS; and recommends that on-site treatment alternatives be considered as part of a site-wide RI/FS.

EPA response: The EPA Proposed Plan focuses on OU1, the canal and lagoon source areas of the site. The NCP provides that the cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the site. OU1 addresses an initial phase of action that comprises an incremental step toward comprehensively addressing site problems. The NCP encourages early actions prior to or concurrent with conduct of an RI/FS as information sufficient to support remedy selection is developed. The data collected on the source areas is sufficient to base a remedial decision for OU1. The NRRB supports the need for action at this site, as well as the region's plan to buy and demolish houses and recommended that EPA work closely with the community to determine how best to preserve the integrity of the existing residential community. The NRRB also pointed out that such work will be necessary to address the highly contaminated source material under any circumstance. The NRRB also recommended that should a more extensive buy-out be required, on-site treatment options should be included in an assessment of alternatives as part of the site-wide RI/FS. Site-wide data is still being gathered, and EPA will not begin remedial construction on OU1 until the results of the site-wide investigation are available.

Comment #55: *There is uncertainty about site conditions that could impact waste treatment and/or disposal options. ATSDR has determined there is neither an immediate nor short-term health threat under existing conditions. Therefore, the more prudent course of action is to await completion of the ongoing sampling and RI/FS as referenced in the EPA Proposed Plan. Then, a baseline risk assessment can be completed to develop Site-specific soil cleanup objectives so appropriate response actions can be considered.*

The NRRB memorandum states that the EPA selected its preferred alternative without the benefit of fully understanding site conditions. As a result, the EPA Proposed Plan did not consider an appropriate range of remedial alternatives that adequately took into account these considerations. The NRRB memorandum points out that the appropriate handling of any excavated material or decision on land-use options should be based on a more thorough cleanup strategy.

A more thorough cleanup strategy should focus on on-site, ex-situ and in-situ remedial alternatives, as well as off-site, ex-situ treatment/disposal options other than incineration. As stated in the previous comments, there are on-site, in situ and ex situ, treatment options that are equally protective and more cost effective than the preferred alternative in the EPA Proposed Plan. They should have been part of the range of alternatives considered in developing the EPA Proposed Plan. Additionally, as *we previously commented, off-site facilities exist that can accept the material for thermal treatment (New Jersey), recycling or land disposal (Canada). As noted by the NRRB, on-site treatment options may become more practicable following completion of a site-wide RI/FS. The range of in situ and ex-situ remedial alternatives that we identified in our prior comments have been employed at other similar CERCLA sites and are far more cost-effective than the preferred alternative in the EPA Proposed Plan.*

EPA response: The contamination in the lagoon and canal areas has been adequately characterized to provide a basis for a remedial decision. The uncertainty of site-wide contamination throughout the development is associated with the extent of subsurface contamination in the other areas of the Claremont Development. The investigation into the sub-surface soil conditions throughout the remainder of the community is ongoing. Consistent with NRRB's recommendation, the ongoing investigation into the subsurface soil conditions for the remainder of the development will be completed prior to the actual removal of any source material.

Comment #56: *EPA failed to develop and consider a full range of remedial alternatives. The EPA Proposed Plan considered only a single alternative. To ensure consistency with the NCP, a more comprehensive evaluation of alternatives needs to be documented before acceptance of the EPA Proposed Plan and issuance of a ROD. This evaluation is properly done at the conclusion of the ongoing RI/FS. The considered alternatives should include biological and thermal treatment options as outlined in our prior comments. Only then will EPA be able to demonstrate they are controlling response cost while promoting a consistent and cost-effective decision.*

Because EPA considered only a single alternative, the NRRB was unable to achieve one of its key objectives: investigating whether other approaches to achieve cleanup had been evaluated. This is one of the subjects that the NRRB is tasked to complete when it reviews a cleanup strategy for consistency with the NCP.

EPA response: EPA considered a full range of alternatives in the EE/CA which included biological and thermal options. The full range of alternatives that were given consideration in the EE/CA were presented to the NRRB as acknowledged by the NRRB in its memorandum dated May 3, 1999, which can be found in the administrative record. The approach used by EPA to select a remedy for the first operable unit is consistent with the NCP in that it will be consistent with the future overall remediation at the site. Consistent with the NCP, EPA's action with regard to the lagoon and canal source areas is a discrete action that comprises an incremental step toward comprehensively addressing site problems.

Comment #57: *The failure to use laboratory cleanup techniques set forth in SW-846 adversely affected the accuracy of reported concentrations and elevated the sample detection limits. EPA made available the raw data from approximately 300 samples that were collected as part of the lagoon and canal delineation for review during this extended comment period. The data are predominantly from soil samples that were analyzed for polynuclear aromatic hydrocarbons (PAHs). The quality assurance information from selected random samples identified problems associated with surrogate recoveries, and matrix and matrix spike duplicate (MS/MSD) analyses. These problems were identified and addressed by the EPA contractor's validators.*

Detection limits were elevated in many of the samples reviewed, primarily due to high concentrations of both target PAHs and non-target heterocyclic PAHs, as indicated in the tentatively identified compound (TIC) data included in the validation reports. Neither of the two laboratories that analyzed the samples used any of the cleanup techniques presented in SW-846 to improve detection limits or bring MS/MSD analyses into control by removing the heterocyclic PAHs.

In not following the prescribed procedures set forth in SW-846, much of the reported concentrations relied upon to develop EPA's Proposed Plan were biased high. Consequently, any calculated exposure point concentration, like benzo(a)pyrene (BaP) equivalents, are overstated. An inaccurate assessment and communication of potential risks will result if biased high data is relied upon to characterize risks.

EPA response: The cleanup techniques used in SW-846 generally remove straight chain hydrocarbons and/or non-substituted hydrocarbon chains and cyclic rings. The cleanup techniques are specifically designed not to affect the presence or concentrations of target groups, i.e., any compounds containing aromatic ring structures, chlorides, phenols, etc. Therefore, any cleanup should not affect “non-target heterocyclic PAH” concentrations due to the presence of polyaromatics on the molecular structures.

Detection limits may have been improved with cleanup if the reason for the dilution was based on the presence of non-target long chain hydrocarbons obscuring the analysis, but there were no target compounds observed which required dilution. The compounds requiring dilution also may or may not have been removed by the cleanup steps. Matrix interferences are observed in complex highly contaminated samples even after cleanup. Therefore, it is inaccurate to state that the use of the cleanup technique would have resulted in all sample runs without dilutions. Sample results used to determine exposure point concentrations were reported from analytical methodologies which identify target heterocyclic PAHs.

The risk analysis performed for the Federal Creosote site used only detected concentrations for the calculations of the exposure point concentrations. The risk results are, therefore, not affected by the high detection limits.

Comment #58: *The reliance on visual contamination in developing and implementing EPA's preferred alternative is inappropriate due to the presence of diesel fuel in the samples. The EPA Proposed Plan states that a subjective criterion, visible contamination, was used for the cleanup criterion and resultant cost and volume estimates. If relied upon during implementation of the remedy, the presence of diesel fuel will distort the scope of the excavation and likely result in unnecessary removal and treatment of soil.*

The diesel fuel was identified in the PAH gas chromotographs (GC) as a series of symmetric peaks at retention times of approximately 18 to 22 minutes. The corresponding mass spectra from late eluting PAHs, such as benzo(g,h,i)perylene, show alkyl fragmentation patterns not characteristic of the parent PAH, confirming the presence of the diesel fuel.

EPA response: Analysis for the presence of diesel fuel was not performed during the sample analysis. Evidence of a diesel fuel gas chromatograph pattern (18 to 22 min) was only seen in relatively few samples. Where a diesel fuel pattern was observed, samples also exhibited high target compound concentrations. Two benzo(g,h,i) perylene mass spectra did show evidence of a hydrocarbon signature pattern. Both were from samples with significant target compound contamination. Integrated ion chromatograms for dibenzo(a,e)pyrene from high concentration samples showed some possible high bias due to background. However, this possible additive effect is minimized due to the presence of other target compounds at 50 to 100 times the concentration of dibenzo(a,e)pyrene in the sample. EPA concludes that there is no evidence of wide spread contamination of diesel fuel at the site, as only relatively few samples show a diesel fuel pattern. Where diesel was possibly observed, there are also high concentrations of target compounds. Therefore, cleanup of creosote product using visual observation is appropriate.

Comment #59: There are insufficient data to support the conclusion that the lagoons and canals are active sources of contamination. As a result of reviewing the additional documents provided by EPA during the extended comment period, we have concluded there are insufficient data to show that the lagoon and canal areas are active source areas. Hence, the EPA should await completion of the site-wide RI/FS so that a comprehensive remedial strategy can be developed that addresses all contamination in a cost-effective and protective manner.

The groundwater data and physical conditions encountered beneath Lagoon A suggest the PAHs are not migrating. Specifically, the Technical Memorandum prepared in November 1998 indicates that there is a dense silt layer, which could not be penetrated, located beneath Lagoon A. If continuous, this layer would serve to inhibit downward migration from the lagoon. With the exception of one geoprobe sample believed to be water from within Lagoon B, groundwater sampling, conducted at various locations around the development, did not detect any constituents above MCLs. Additionally, many of the soil samples collected from the lagoons had solids concentrations greater than 90 percent, suggesting the material has a consistency similar to asphalt. As the PAHs also have extremely low aqueous solubilities, there is no basis of EPA's rational for characterizing these as major sources of soil and groundwater contamination.

EPA response: The ERT Technical Memorandum - Site Investigation reported that contamination was found approximately 120 feet below ground surface in the bedrock formation. In addition, ERT sampling results from the Millstone River indicate that PAHs have migrated from the site to the Millstone River. PAH concentrations in sediment samples taken downstream of the site were an order of magnitude higher than sediments samples taken from a location upstream of the site.

The lagoon and canals remain in place beneath the Claremont Development and, in several areas, are at or near the soil surface and are accessible to residents either by direct contact with the surface or by contact during digging. Some material has been found to be weathered and, as a result, does have the consistency of asphalt, but this is generally found to be true of the material located closer to the ground surface which still represents a direct contact threat.

C. WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD FROM THE COMMUNITY

Comments and concerns which were not addressed at the public meeting were accepted in writing during the public comment period. Written comments were received in a letter from the Mayor of Manville. In addition, letters were received from several residents. They are answered in the following part of the Responsiveness Summary. These written comments are categorized by relevant topics and presented as follows:

1. Superfund Process
2. Relocation

1. Superfund Process

Comment #60: The results of the site investigation performed to date and the EPA pumping tests at the Manville Borough wells indicate a clear and compelling reason for EPA to quickly proceed with cleanup of the lagoon and canal areas, preferably by complete off-site removal. We believe that the EPA has the jurisdiction, authority, and ability under CERCLA to either i) perform the lagoon and canal area cleanup as a removal action; or ii) immediately allocate funds under either the Removal or Remedial programs to start cleanup of the lagoon and canal areas.

EPA response: During previous community meetings, EPA has indicated that remediation of the site (i.e., addressing the creosote waste and contaminated soil) could not immediately begin due to the need for careful planning and design of the cleanup. EPA also informed the public that the cleanup would occur under EPA's Remedial Program. The commenter urges EPA to begin immediate cleanup actions at the lagoon and canal areas under the Agency's Removal Program, due to imminent risk to drinking water and groundwater.

Under the present course of action, EPA is proceeding as quickly as it possibly can to begin a cleanup at the site. However, the Agency cannot begin on-site remediation, either through the Remedial or the Removal Program, until the relocation of residents in the affected areas is complete. This process could take nine months to a year to perform. Furthermore, EPA has repeatedly informed the public that any cleanup activities would result in disruptions to the residents remaining on the site. In order to minimize these disruptions and ensure that the cleanup is performed in the safest and most expedient manner, the Agency will need to develop a detailed design for the remedial activities. Due to the extensive scope of the cleanup, this design would need to be developed regardless of the program utilized to cleanup the site. EPA is continuing a site-wide investigation that may be used to develop a cleanup strategy for potentially contaminated areas within the Claremont Development that are located outside of the lagoon and canal areas. The Agency anticipates that the overall cleanup plan for the site will be available for public comment and ready to proceed to the design phase concurrent with completion of relocation activities. Therefore, EPA does not believe that there will be any delays using this approach.

2. Relocation

Comment #61: All homes should be bought out giving the residents a chance to relocate and live in a safe environment.

EPA response: To this date, investigations at the site have indicated that the historic canal and lagoons from the Federal Creosote site remain buried beneath only limited portions of the Claremont Development, and not the entire development. The ongoing investigation will characterize the extent of subsurface contamination in the other areas of the development. Should this investigation determine that additional source areas are in locations such that other structures would have to be removed to extract the source material, then additional properties will be purchased as necessary.

Comment #62: Two commenters stated that as homeowners on the potential buyout/buyout list, they would like to have the Right of First Refusal. After cleanup is completed, the property they received compensation for should be offered to them first for purchase. The commenters also stated that they would like to pay a fair price below market value without bidding against developers.

EPA response: In the event of a property buyout, the title to the land would be transferred to the State pf New Jersey. In similar circumstances at other sites, the previous land owner has been given the first opportunity to reacquire the property.

Comment #63: Faced with the possibility of being temporarily relocated, one commenter favored a buyout of his property citing the inconvenience of busing children to school from a temporary location. In addition the commenter stated that he feared for the health and safety of his family if they continued living in the community during any phase of the cleanup.

EPA response: To implement Alternative 2, EPA believes that permanent relocation of residents will be required at not more than 19 properties. In addition, temporary relocation of residents is expected for a small number of properties (estimated at less than 20) during certain periods of the work. Temporary relocation is typically needed when utilities need to be disconnected for an extended period or if access to a property is considerably limited by the work. It is EPA's experience that temporary relocation of property residents is effective, and that property acquisition would not expedite the process. EPA acknowledges that temporary relocation is disruptive and burdensome on residents, and will attempt to keep residents in their homes whenever possible.

At other sites where temporary relocation was required, EPA has attempted to minimize the time for relocation as much as possible, and has made efforts to find comparable residences with similar access to schools, shopping, parking, and other neighborhood amenities. EPA has also accommodated families with special needs, such as those requiring wheelchair accessability, and has attempted to provide rental properties that accept pets, when required.

APPENDIX A

PROPOSED PLAN

SUPERFUND PROPOSED PLAN

FEDERAL CREOSOTE SITE
MANVILLE, NEW JERSEY

USEPA APRIL 1999

PURPOSE OF PROPOSED PLAN

This Proposed Plan identifies the preferred alternative for cleaning up canal and lagoon areas (referred to as the source areas) at the Federal Creosote Superfund Site. These areas are contaminated with creosote, a substance that consists primarily of semivolatile organic compounds, specifically polycyclic aromatic hydrocarbons (PAHs). The preferred alternative is Excavation and Off-Site of the lagoon and canal areas.

Based on the information EPA has obtained to date, ten houses sit over or adjacent to the lagoons. In order to excavate the lagoon wastes, EPA must demolish the houses. EPA proposes to acquire the affected properties and permanently relocate the residents. Following permanent relocation, the houses would be demolished. The number of properties that may need to be acquired may change, if the recently collected subsurface data indicates that the canals and lagoons are more extensive than expected. In addition, a number of residents may have to be temporarily relocated due to excavation activities on or in close proximity to their properties. The extent of any temporary relocations will be determined at a later date.

This document is issued by the United States Environmental Protection Agency (EPA), the lead agency. The New Jersey Department of Environmental Protection (NJDEP) is the support agency for site activities.

EPA is issuing this Proposed Plan as part of its community relations program under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund). This proposed Plan summarizes information that can be found in greater detail in the Engineering Evaluation/Cost Analysis, EPA's December 1995 presumptive remedy directive for wood treater sites, and other documents contained in the Administrative Record for the site. EPA will select a final remedy for the lagoon and canal source areas only after the public comment period discussed below has ended and the information submitted during this period has been reviewed and considered. A responsiveness summary addressing the public comments will be issued as part of the Record of Decision (ROD) which will document the appropriate response actions for the site.

DATES TO MARK ON YOUR CALENDAR

April 30, 1999 to June 1, 1999: Public comment period on proposed remedial alternative.

May 12, 1999: Public meeting at Weston School Auditorium, Manville, New Jersey.

EPA encourages the public to review these and other documents in the Administrative Record in order to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted there. The

Administrative Record which contains the information upon which the selection of the response action will be based, is available at the following locations:

Manville Public Library
100 South 10th Ave.
Manville, New Jersey 08835
(908) 722-9722

Hours:	Mon., and Fri.	9:00am-5:00pm
	Tue., and Thurs.:	noon-8:00pm
	Wed.;	11:00am-8:00pm
	Sat.:	9:00-2:00pm

and can also be found at:

EPA-Superfund Records Center
290 Broadway, 18th Floor
New York, New York 10007-1866
(212) 637-4308
Hours: Mon - Fri, 9:00am - 5:00pm

SITE BACKGROUND

The site is located in the Borough of Manville, Somerset County, New Jersey (see Figure 1), and is currently an active residential community of single-family homes on approximately 35 acres. The community was developed starting in the early mid-1960's. A creosote plant had operated on the land from approximately 1910 to the mid-1950's.

The site is located within the Raritan River watershed system. The Raritan River is located approximately 2,000 feet north and east of the site and Millstone river is located approximately 1,200 feet to the southeast. The site is situated on a topographic high that is nearly equidistant from the Raritan and Millstone Rivers and approximately a mile west (upstream) of their confluence. The site is bordered to the west by a variety of commercial uses, including the Rustic Mall, which occupies 15 acres of the former wood-treating property. To the north, on the opposite side of Conrail tracks, is the former Johns-Manville property. The Johns-Manville company property is currently being redeveloped for a variety of commercial and retail uses, including automobile transshipment, warehousing, and large retail stores.

To the south, on the opposite side of Conrail tracks, the area is primarily residential.

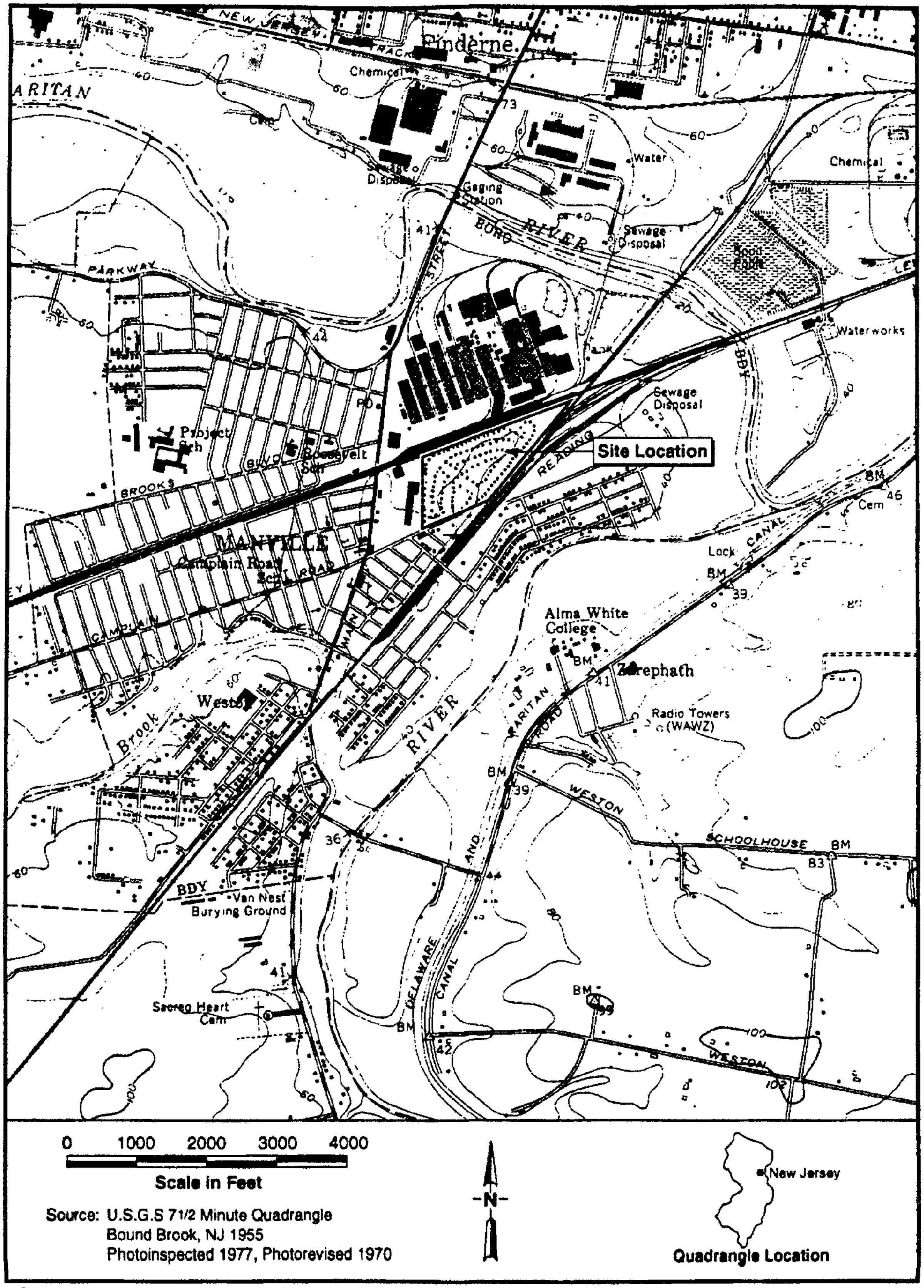
The wood treatment facility closed in the mid-1950's, and in the early 1960's, 15 acres of the property were developed as the Rustic Mall for commercial and retail use. In the 1960's, 35 acres adjacent of the site were developed for single-family housing, known as the Claremont Development, which now consists of 137 single-family homes.

In April 1996, NJDEP responded to an incident involving the discharge of an unknown liquid from a sump located at one of the Claremont Development residences on Valerie drive. A thick, dark brown, tarry, oil-like substance was observed flowing from the sump to the street. In January 1997, the Borough of Manville, responded to a complaint that a sinkhole had developed around a sewer pipe in the Claremont Development along East Camplain Road. Excavation of the soil around the pipe identified a black tar-like material in the soil. Subsequent investigations of these areas revealed elevated levels of contaminants consistent with creosote.

A review of historical information revealed that, during this operation, the facility treated railroad ties and telephone poles with creosote and discharged the excess via canals to two lagoons located on the site. The creosote material discharged into these lagoons was not removed prior to the development of the property for residential and commercial use. The Claremont Development residential community and the Rustic Mall were built over much of the former Federal Creosote property.

Following the discovery of this material, NJDEP, with technical assistance from EPA, began an investigation of the site. In April and May 1997, air samples were collected inside the majority of homes in the Claremont Development. There was no indication that the site-related contaminants were present in the homes at elevated levels.

In October 1997, EPA’s Environmental Response Team (ERT) initiated a limited site investigation. This investigations included the



98P-2752

FIGURE -1 VICINITY MAP OF THE FEDERAL CREOSOTE SITE, MANVILLE, SOMERSET COUNTY, NEW JERSEY

collection of surface and subsurface soil samples at select locations within the residential development. Over 100 surface and subsurface soil samples were collected on properties believed to contain creosote contamination based on analysis of historical aerial photographs and input from the residents themselves. A number of these samples revealed elevated levels of the chemicals that make up creosote - PAHs. The results of this investigation can be found in the November 19998 report entitled “Technical Memorandum - Site Investigation Report”. (This report and all other documents mentioned in this Proposed Plan are available in the Administrative record for the site.)

In January 1998, responsibility for the site was transferred from NJDEP to EPA.

From February through April 1998, ERT collected over 1350 surface soil samples on 133 properties in and adjacent to the Claremont Development in order to determine if an immediate health risk existed. The results of the surface soil sample analyses were made available to each individual property owner, and can be found in the “Interim Surface Soils Human Health Risk Assessment”, dated June 19, 1998. EPA identified 19 properties with surface soil in yards containing elevated levels of creosote. While the levels were elevated, a risk assessment showed that they did not pose a short-term (acute) risk to residents. However, the risk assessment did show that the levels posed a long-term risk greater than EPA’s acceptable risk range. Therefore, EPA applied topsoil, mulch, seed and so on properties that contained elevated levels of creosote in surface soils to limit the potential for exposure. In addition, EPA installed an odor control system in the basement of one property and installed a storm water drainage system (including cover) on one property. All of this work was performed by EPA’s removal program.

In February 1999, the Agency for Toxic Substances and Disease Registry (ATSDR) completed a health consultation that assessed the public health impact from direct contact with the surface soils. ATSDR concluded that the surface soil concentrations of lead, arsenic and PAHs do not pose a public health hazard.

As part of its site investigation, ERT installed 17 groundwater monitoring wells to begin to define the extent of groundwater contamination. The public water supplies and monitoring wells installed in and around the site were sampled for any site-related contamination in March and April 1998 by ERT. The results of this sampling indicated that the public water supplies are not currently being affected by contamination from the site. However, the results of the groundwater sampling from monitoring wells located on the site do indicate that the ground water, classified by NJDEP as GW IIA, potable water, is contaminated with components of creosote. A comprehensive groundwater investigation is being conducted to complete the characterization of the groundwater conditions in the area surrounding the site.

In November 1998, EPA initiated a remedial investigation and feasibility study (RI/FS) to more fully characterize the nature and extent of contamination at the site. Subsurface soil sampling started in December 1998 and was completed in March 1999. Over 200 borings were installed, and about 1,400 soil samples have been collected for analysis. The subsurface soil borings will characterize soils that lie beneath the Claremont Development. In addition, the results of sampling will provide more accurate data concerning the lateral and vertical extent of the lagoon and canal source areas.

In March 1999, as part of the RI, a more extensive groundwater investigation was initiated to characterize the vertical and lateral extent of groundwater contamination caused by the site. Approximately 30 additional monitoring wells will be installed and tested in areas surrounding the development. Several of the subsurface boring holes from the soil investigation have been converted into shallow monitoring wells that, when sampled, will provide information on the quality of shallow ground water at the site. In addition, sediment samples in the Millstone River and Raritan River will be taken as part of the RI to determine if the site has impacted the river.

Completion of the field work for this broader site investigation is expected in the fall of 1999. Following these investigations, EPA will evaluate what other remedies are necessary to address the site.

The site was proposed for the National Priorities List (NPL) on July 27, 1998, and was formally included on the list on January 19, 1999.

The data from the 1997 investigation conducted by ERT indicate that the canal and lagoon areas are the major source of soil and groundwater contamination in the Claremont Development. Therefore, EPA believes it prudent to expedite the remediation of these source areas. In order to expedite this action, an Engineering Evaluation/Cost Analysis (EE/CA) was prepared to evaluate remediation options for only the lagoon and canal source materials. This EE/CA was completed in April 1999.

SITE CHARACTERIZATION:

Preliminary determinations of the locations of the canal and lagoons were based on various historical aerial photographs. The locations of these sources were further refined by the limited subsurface soil investigation conducted in 1997 by EPA's ERT. This investigation confirmed that the canals and lagoons were not removed before the Claremont Development was built. The canal and lagoon found in the northern portion of the Claremont Development have been designated as Canal A and Lagoon A, respectively. The canal and lagoon found in the southern portion of the development have been designated as Canal B and Lagoon B, respectively.

The description and dimensions of the lagoons and canals provided below is based on the 1997 ERT data. Once data is evaluated from the 1998/1999 subsurface sampling activities, these dimensions may change. Canal A extends approximately 400 feet from Valerie Road, through four residential properties on Valerie Drive to a point where it meets Lagoon A at 90 Valerie Drive. The canal is approximately eight feet wide, four to eight feet deep, with the upper surface about three feet below the present surface of the yards (see Figure 2).

Lagoon A is approximately 375 feet in length and extends through the backyards of 90, 98, 104, and 110 Valerie Drive. The top of Lagoon A is approximately eight to ten feet below ground surface and the lagoon is at least six feet thick in some places. In addition, an exit trench associated with Lagoon A apparently served as a drainage way for overflow material to the exit lagoon. This exit trench has been found along the back property lines of approximately five properties on Valerie Drive east of Lagoon A.

Canal B is approximately 1,500 feet in length and extends from the parking lot of the Rustic Mall near Summit Bank, along the north side of East Camplain road, through 10 to 13 residential properties, to a point where it meets Lagoon B at 186 East Camplain Road. Like Canal A, Canal B is approximately eight feet wide. Very little fill was found above Canal B. The bottom of Canal B is estimated to range from several inches to eight feet below the ground surface.

Lagoon B extends about 300 feet from southwest to northeast. The lagoon is located on properties at 186, 192, 198, 204, and 210 East Camplain road, and may extend into the back yard of 216 East Camplain Road.

The yards of these properties slope downward from the rear of the homes toward the back property boundary near the railroad tracks. Total evaluation change is about six feet. Soil borings near the rear yards showed that the lagoon is within about two feet of the surface. Closer to the houses, the lagoon is about six feet below ground surface due to fill that was placed prior to construction of the homes. Lagoon B extends to a depth of 20 to 25 feet.

The total volume of the above source areas is estimated to be 44,158 cubic yards based on the available data. However, this volume may change substantially pending a review of the subsurface data.

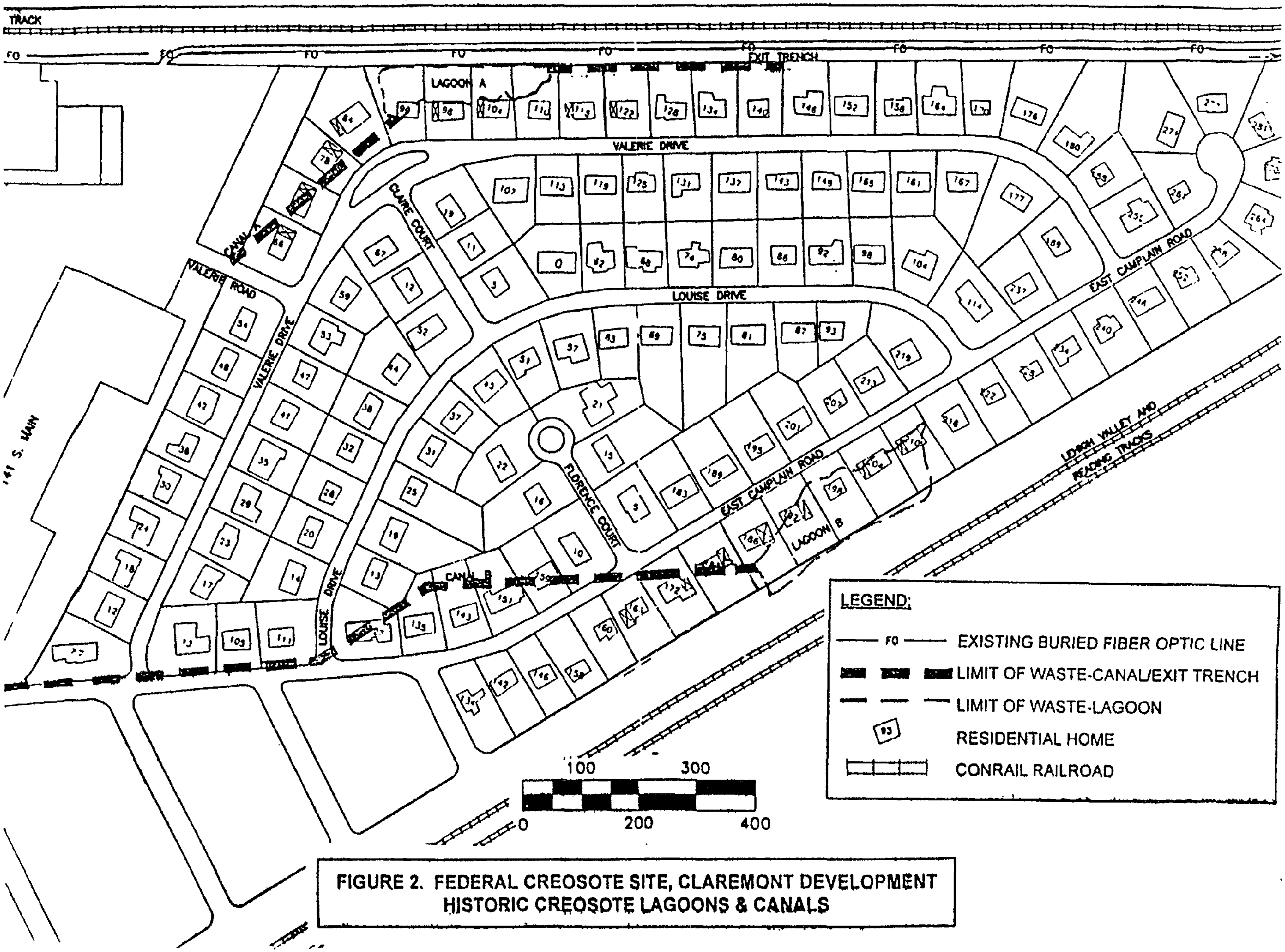


FIGURE 2. FEDERAL CREOSOTE SITE, CLAREMONT DEVELOPMENT HISTORIC CREOSOTE LAGOONS & CANALS

SCOPE AND ROLE OF ACTION:

This Proposed Plan identifies a cleanup strategy for the first phase, or Operable Unit, at the site and is considered to be an early action that only addresses the cleanup of the highly contaminated source areas: the lagoons and canals. Based on the information EPA has to obtained to date, ten houses are located either directly over or immediately adjacent to the lagoons. In addition, the canals and the Lagoon A exit trench have been found on 22 other properties within the Claremont Development. Portions of the canals appear to lie underneath houses on some of the 22 properties.

The scope of this Operable Unit is estimated to include 32 residential properties: 10 properties associated with the lagoons; and 22 properties associated with the canals and the Lagoon A exit trench. To the extent that the lagoons and canals extend beneath public roads within the Claremont Development, those roads would also be included in the Operable Unit.

EPA plans to initiate this cleanup action in order to address the worst threats first at the site and to initiate a remedy for the source areas as early as possible. As described below, EPA's proposed action would require the permanent relocation of residents from an estimated ten to nineteen properties, so that the houses can be demolished to get at the contaminant source areas. (The exact number of permanent relocations needed to address the source areas will be determined after the ongoing subsurface investigations described above is completed). Other residents may also require temporary relocation during the work of addressing the source areas. Because the permanent relocation processes can be time-consuming, this early action serves to initiate the relocation process as early as possible. Until the permanent and temporary relocations are complete, EPA cannot begin any excavation activities.

This Proposed Plan does not address any potential contamination on other residential properties within the Claremont Development, within the Rustic Mall, or in the ground water. Any contamination from the Federal Creosote site found in these areas may be the subject of future actions. The results of EPA's investigations of the other 105 residential properties in the Claremont Development may be available in the summer of 1999. EPA expects to issue another Proposed Plan to address those properties in the fall of 1999.

SUMMARY OF SITE RISKS:

EPA has conducted an investigation of subsurface soils in the areas historically occupied by the lagoons and canals at the Federal Creosote site. The risk assessment focused on contaminants in the subsurface soil that are likely to pose significant risk to human health and the environment. PAHs associated with creosote use are the main contaminants of concern at the site. There are 23 PAH compounds, seven of which are considered carcinogenic. A full list of target PAH compounds can be found in Table 1. Historically, PAH concentrations have been reported using several means including: total PAH concentration (TPAH); total carcinogenic PAH concentration (CPAH); and benzo(a)pyrene equivalents (BAP). TPAH is the sum of all PAH concentrations in a sample and is always greater than or equal to CPAH. BAP is a weighed (given consideration to the intrinsic carcinogenicity of each compound) average of the individual carcinogenic PAHs and can be used to assess the carcinogenicity of CPAH in terms of benzo(a)pyrene (a carcinogenic PAH that has been studied extensively).

Sampling results from both lagoons (A and B) and canals (A and B) demonstrated high concentrations of TPAH, CPAH and BAP. The maximum detected concentrations in terms of benzo(a)pyrene equivalents (BAP) for Lagoon A, Lagoon B, Canal A and Canal B were 1,862 parts per million (ppm), 2,548 ppm, 357 ppm and 595 ppm, respectively. See Table 2 for a summary of the maximum detected concentrations of PAHs in the lagoons and canals.

The limited surficial soil covering the lagoons and canals does not provide an adequate or permanent barrier to exposure. Future subterranean disturbance of the lagoon and canal areas could result in the following exposure pathways: incidental ingestion of soil, dermal contact with soil, and inhalation of fugitive dust. In addition, the lagoons and canals serve as a continuing source of groundwater contamination.

For known or suspected carcinogens, EPA has established an acceptable cancer risk range of one-in-ten thousand to one-in-a-million. Action is generally warranted when excess lifetime cancer risk exceeds one-in-ten thousand.

In its Interim Surface Soils Human Health Risk Assessment (June 1998) for surface soils, EPA assessed risk by calculating a “trigger level” for BAP equivalents which equates to various risk levels. This “trigger level” can be used as a point of comparison for lagoon and canal area source materials. The trigger level of 9 ppm BAP equivalent in soil equates to an excess lifetime cancer risk of one-in-ten thousand under a conservative residential exposure scenario. The maximum BAP equivalent concentration in each of the lagoon/canal areas was compared to the trigger level BAP equivalent concentration of 9 ppm and found to far exceed that level. Thus, under reasonable maximum exposure conditions to lagoon/canal-associated soils, the potential excess lifetime cancer risk to residents significantly exceeds EPA’s acceptable risk range.

Actual or threatened releases of PAHs from the lagoon/canal areas, if not addressed by the selected alternative, may present an imminent and substantial endangerment to the public health.

SCREENING EVALUATION OF ALTERNATIVES:

The information presented in the Technical Memorandum-Site Investigation Report, prepared by ERT, was used to focus and conduct the EE/CA that evaluates cleanup alternatives for the site. In addition, EPA considered the December 1995 EPA Directive “Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites” in preparing the EE/CA. The EE/CA provides an evaluation of various options, referred to as remedial alternatives, to address the source areas at the site.

The remedial alternatives available for addressing the source material are limited. EPA considered on-site containment as an alternative for the canals and lagoons. However, EPA’s technical evaluation of available containment options indicated that the source areas could not be effectively or reliable contained. In addition, the wastes, within these source areas are considered “principal threat wastes” at the site. They represent a significant direct contact threat and have already impacted area groundwater quality. Whenever practicable, EPA expects to utilize treatment to address such principal threat wastes. As a result of the uncertainties associated with on-site containment and EPA’s determination that the canal and lagoon areas comprise principal threat wastes, the on-site containment alternative was eliminated from further consideration.

EPA’s Presumptive Remedy Directive considered three technologies effective in treating creosote wastes: bioremediation; thermal desorption; and incineration. The EE/CA considered on-site and off-site applications of these technologies. Due to the residential nature of the site and the lack of available space, on-site treatment of the creosote waste was not considered practicable.

The use of each of these presumptive remedies in an off-ste scenario was considered by EPA. Since the material in the source areas is a listed waste under the Resource Conservation and Recovery Act (RCRA), any off-site treatment and disposal would need to be performed at a RCRA-permitted treatment and disposal facility. Because RCRA-permitted treatment facilities that employ bioremediation or thermal desorption are unavailable, thermal treatment involving incineration is believed to be the only available option for off-site treatment. Consequently, in developing the alternatives, it is assumed that the source material would be transported to a commercial incineration facility for treatment and disposal.

More detailed descriptions of the remedial alternatives can be found in the EE/CA report, which is available in the Administrative Record.

SUMMARY OF ALTERNATIVES:

The remedial alternatives for the site are:

Alternative 1: No Action

Alternative 2: Excavation and Off-Site Thermal Treatment Disposal

Alternative 1: No Action

Capital Cost:	$0
Annual Operation and Maintenance (O&M):	$0
Present Worth:	$0
Time to Implement:	not applicable

Superfund regulations require that the No Action alternative be evaluated at every site to establish a baseline for comparison with other remedial alternatives.

Under this alternative, no further remedial actions would be taken to address the source areas. Because no action results in contaminants remaining on site above acceptable levels, a review of the site at least every five years is required.

Alternative 2: Excavation and Off-Site Thermal Treatment and Disposal

Capital Cost	$58,000,000
Annual Operation and Maintenance (O&M):	$0
Present Worth:	$58,000,000
Time to Implement:	2-3 1/2 Years

Alternative 2 includes the excavation of off-site transportation of the source materials associated with the lagoons (including the Lagoon A exit trench) and canals for thermal treatment and disposal. For this early action only, EPA has used a visible contamination threshold as the cleanup level for cost and volume estimation purposes. This is due to the fact that EPA has not yet completed the baseline risk assessment and its associated quantitative determination of cleanup levels. However, these subsurface soil cleanup levels will be developed prior to the excavation of the creosote source material and any adjacent contaminated soil. This will ensure that all unacceptable material is removed in a single cleanup action.

The time to implement does not include the necessary preliminary steps of designing the remedy or permanently relocation residents, which may each take up to one year, but will be conducted concurrently. In addition, the time to implement is shown as a range due to uncertainties relative to the exact number of houses that need to be underpinned prior to excavating, the extent of excavations in the canals, the exact number of houses that need to be temporarily and permanently relocated, and the extent to which both Canal/Lagoon A and Canal/Lagoon B can be remediated at the same time. Concurrent remediation of these areas may not be feasible if it adversely restricts access to the development. If these areas are remediated sequentially, the time to implement will be lengthened; however, the disruption to the whole development may be minimized.

As mentioned previously, EPA's proposed action would require the permanent relocation of residents from an estimated ten to nineteen properties, so that the houses can be demolished to excavate the source areas. Investigations to date indicate that ten houses in the Claremont Development have been built on top of or adjacent to the lagoon source areas and nine houses may have been built on the canal source areas.

For houses that may be located on the canal source areas, the number of permanent relocations needed to excavate the canals will be determined after the ongoing subsurface investigation is completed.

For the purpose of excavating the lagoons, the affected properties would need to be acquired by EPA and the residents permanently relocated. Following permanent relocation, the houses on these properties would be demolished. Based on current data, Lagoon A is believed to be located beneath the following properties: 90 Valerie Drive, 98 Valerie Drive, 104 Valerie Drive, and 110 Valerie Drive. It is estimated that Lagoon A would involve the excavation of approximately 7,200 cubic years of soil. The depth of the excavation is currently estimated to be 10 feet. Based upon current data, Lagoon B is believed to be located beneath the following properties: 186 East Camplain Road, 192 East Camplain Road, 198 East Camplain Road, 204 East Camplain Road, 210 East Camplain Road, and may extend into the backyard of 216 East Camplain Road. To excavate the source area associated with Lagoon B, approximately 29,946 cubic yards of material would be removed.

It is estimated that approximately 3,012 cubic yards of material would be excavated from Canal A and the Lagoon A exit trench. It is further estimated that approximately 4,000 cubic yards of material would be excavated from Canal B. Residents of affected properties on Valerie Drive and East Camplain Road may need to be temporarily relocated during some or all of the excavation activities on their properties. It is anticipated that temporary relocation would be for a period of six months to one year. Because Canal A, the Lagoon A exit trench and Canal B are all relatively shallow, it is expected that structural engineering measures such as foundation underpinning can be used to remove the source areas from these properties without demolishing the houses. However, until all of the subsurface data is received, EPA cannot determine whether extensive contamination exists at depth on these properties that may result in the need to acquire more homes in order to excavated the canal contamination.

During the excavation of Lagoon B, it is anticipated that portions of East Camplain Road may need to be closed to provide room for construction equipment. As a result, residents in Florence Court and some residents on East Camplain Road may need to be temporarily relocated.

During the excavation of the lagoons, the use of a prefabricated fabric structure (PFS) equipped with a ventilation system may be necessary to control noise, dust, odors, and to limit rainwater in the excavation area. Air emissions from the PFS would be treated prior to discharge to the atmosphere. For canal excavation, the use of the PFS is not believed necessary. Air monitoring would be conducted during the excavation of the canal and lagoon areas.

The source material is a RCRA-listed waste, and would be transported for off-site thermal treatment (incineration) and disposal. In excavation areas where houses would be demolished, the lots would be completely backfilled and would be revegetated and restored as open lots.

EVALUATION OF CRITERIA:

This section describes the requirements of CERCLA in the remedy selection process. Remedial alternatives are evaluated using the following criteria:

Overall Protection of Human Health and Environment: This criterion addresses whether or not a remedy provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment, engineering controls or institutional controls.

Compliance With ARARs: This criterion addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) of other environmental statutes and/or provide grounds for invoking a waiver.

Long - Term Effectiveness and Permanence: This criterion refers to the ability of the remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

Reduction of Toxicity, Mobility or Volume: This criterion addresses the degree to which a remedy utilizes treatment technologies to reduce the toxicity, mobility or volume of contaminants.

Short - Term Effectiveness: This criterion considers the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

Implementability: This criterion examines the technical and administrative feasibility of a remedy, including availability of materials and services needed to implement the chosen solution.

Cost: This criterion addresses capital and operation and maintenance costs of each alternative.

State Acceptance: This criterion indicates whether, based on its review of the EE/CA and the Proposed Plan, the State concurs with, opposes, or has no comment on the proposed alternative.

Community Acceptance: This criterion will assess the community interest and concerns and evaluated comments. These comments will be addressed in the responsiveness summary section of the ROD.

ANALYSIS OF CRITERIA:

OVERALL PROTECTION: The lagoon and canal areas act as a continuing source of groundwater contamination.

Alternative 1, the no action alternative, would not be protective of human health and the environment because the site would remain in its current condition. Under this alternative, contaminated subsurface soils would remain in place at the site and would not be subject to a remedial action. The limited surficial soil covering over the lagoons and canals does not provide a protective barrier from exposure. In addition, under the no action alternative, the lagoons and canals would continue to serve as a source of groundwater contamination.

Under Alternative 2, excavation of off-site thermal treatment and disposal, all of the identified subsurface soils exhibiting signs of visible contamination would be excavated and incinerated off site. EPA is currently describing this alternative based on visible cleanup goals since the baseline risk assessment and its associated quantitative determination of cleanup levels have not yet been completed. The subsurface soil cleanup levels will be developed prior to he actual removal of the creosote source material and any adjacent contaminated soil.

Excavation and off-site thermal treatment and disposal would eliminate: (1) actual or potential exposure of residents to contaminated soils; and (2) the level of contaminants that might migrate to the groundwater. Any potential environmental impacts would be minimized with the proper installation and implementation of dust and erosion control measures, by performing excavation within a PFS where practicable and if determined to be necessary, by conducting water pretreatment, and by using a lined temporary staging area.

There would be no local human health or environmental impacts associated with off-site disposal because the contaminants would be removed from the site to a secured location.

COMPLIANCE WITH ARARS: Actions taken at any Superfund site must meet all applicable or relevant and appropriate requirements of federal and state law or provide grounds for invoking a waiver of these requirements. Alternative 2 would comply with ARARs. Major ARARs are briefly described below.

The Resource Conservation and Recovery Act is a federal law that mandates procedures for treating, transporting, storing, and disposing of hazardous substance. All portions of RCRA which are applicable or relevant and appropriate to the proposed remedy for the site would be met by Alternative 2.

The source materials associated with the two canals and lagoons consist of coal-tar creosote. Soils excavated from the site during remediation and all or part of the associated debris are a listed hazardous waste (F034) as defined in RCRA. As a listed hazardous waste, excavated soil is subject to the Land Disposal Restrictions (LDRs) under RCRA.

The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, which provides regulations and guidance for the government in conducting relocation activities where property is acquired, is not an environmental law, but would have baring on Alternative 2, which proposes permanent relocation. The Act provides for uniform and equitable treatment of persons displaced from their homes by federal programs. All portions of the Act that are applicable to the proposed action would be met by Alternative 2.

LONG-TERM EFFECTIVENESS AND PERMANENCE: The no action alternative offers no long-term effectiveness and permanence. In contrast, the excavation and removal of the lagoons and canals would represent a permanent solution for portion of the site, because the source material would be entirely removed from these areas and transported to a hazardous waste facility. In addition, the waste material would be treated to destroy the contaminants, providing for a permanent solution to the waste.

Off-site treatment/disposal at a secure, permitted hazardous waste facility for the contaminated soil is a technically viable and often used disposal technique. These options are reliable because the design of these types of facilities includes safeguards and would ensure the reliability of the technology and the security of the waste material.

REDUCTION OF TOXICITY, MOBILITY AND VOLUME: The no action alternative does not provide for any reduction of toxicity, mobility, or volume of the waste material in the source area.

In contrast, removal and treatment of source material significantly reduces the toxicity, mobility, and volume of contaminants through treatment. Thermal treatment by incineration generally treats organic contaminants by subjecting them to temperatures typically ranging from 1,200 to 2,000 degrees Fahrenheit in the presence of oxygen and flame. During incineration, the toxicity of the source material would be reduced when volatilization and combustion convert the organic contaminants to less toxic compounds such as carbon dioxide, water, hydrogen chloride, and sulfur oxides.

SHORT-TERM EFFECTIVENESS: During excavation and staging of the soils, health and safety measures would be implemented to protect surrounding residents and field personnel from exposure to the contaminated materials. Any potential environmental impacts would be minimized with the proper installation and implementation of dust and erosion control measures, by performing excavation with appropriate health and safety measures, which may include a prefabricated structure where practicable, by conduction water pretreatment, and by using a lined temporary staging area. Appropriate transportation safety measures would be required during the shipping of contaminated soil to the disposal facility.

IMPLEMENTABILITY: Excavation techniques are commonly used in construction and by environmental remediation firms. The installation of sheet piling and erection of prefabricated structures have also been employed at numerous and similar environmental remediation sites. Underpinning of houses during excavation has also been used at other Superfund remediation sites. The heavy equipment necessary to implement this alternative is readily available and typically used for excavation activities. Numerous vendors are available to procure or rent the necessary prefabricated structures. Also, the quantities of backfill soil needed for excavations are available.

The personnel required to operate the heavy equipment would require appropriate OSHA certifications (e.g., hazardous waste worker), in addition to being certified in the operation of the heavy equipment. Such individuals are readily available.

The property buyouts associated with permanent relocation would result in some scheduling uncertainties related to the time necessary to complete negotiations with all affected homeowners. In addition, various issues inevitably arise during the negotiation process with the individual homeowners that can complicate and lengthen the acquisition process.

Permitted hazardous waste facilities for treating creosote-contaminated material are available and have the capacity to accept the estimated volumes of waste identified for removal. This treatment option is reliable because of the stringent design and operation requirements imposed by permits. Following thermal treatment, the treated material would be disposed of in a Subtitle C landfill. Publicly Owned Treatment Works (POTWs) are also available for receiving pretreated water collected during excavation operations for the response action.

During excavation and staging of the waste soils, health and safety measures would be implemented to limit surrounding residents and field personnel from exposure to the contaminated materials. Excavation techniques could be implemented in relatively short time period because the necessary equipment is readily available. Demolition of homes associated with excavations could be performed without specific or highly specialized construction controls.

COST: Cost of the no action alternative is $0. Cost of excavation and off-site thermal treatment and disposal is approximately $58 million.

STATE ACCEPTANCE: The State of New Jersey agrees with the general approach of the preferred remedy is this proposed plan.

COMMUNITY ACCEPTANCE: Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the Record of Decision for the site.

SUMMARY OF THE PREFERRED ALTERNATIVE:

The preferred alternative for addressing the source areas of contamination is Alternative 2, excavation and off-site thermal treatment and disposal.

The preferred alternative is believed to provide the best balance of trade-offs among the alternatives with respect to the evaluation criteria. Based on the information available at this time, EPA and NJDEP believe the preferred alternative will be protective of human health and the environment, will comply with ARARs and will reduce the toxicity, mobility and volume of contaminants to the maximum extent practicable. Because the preferred alternative would treat contaminated material, it would also meet the statutory preference for the use of a remedy that involves treatment as a principal element.

EPA plans to implement the preferred alternative in a phase manner and will be initially moving forward with the relocation of affected residents. However, the agency does not plan to begin the actual removal of the source area contamination until the site-wide RI/FS is completed. EPA believes that the full extent of contamination within the development should be known prior to the initiation of intrusive cleanup activities. As indicated previously, the available data indicate that 32 residential properties need to be remediated, ten to nineteen of which will require the permanent relocation of residents. Based on this data, EPA believes that excavation and off-site thermal treatment of the lagoon and canal wastes, while maintaining the existing nature and character of the development, is the appropriate remedy for the site. If, however, the ongoing investigation of the remaining 105 properties in the development reveals extensive contamination necessitating the purchase of a significant number of additional properties, EPA may reconsider the portion of the proposed remedy dealing with the source areas. Any such change would be subject to full public input and comment.

COMMUNITY ROLE IN THE SELECTION PROCESS:

EPA and NJDEP rely on public input to ensure that the remedy selected for each Super fund site is fully understood and that the agencies have considered the concerns of the local community, and to ensure that the selected remedy provides an effective solution.

EPA has set a public comment period from April 30, 1999 to June 1, 1999 to encourage public participation in the selection process. The comment period includes a public meeting during which EPA will discuss the EE/CA and the Proposed Plan, answer questions, and accept both oral and written comments.

The public meeting is scheduled for May 12, 1999 at 7:00 pm and will be held as Weston School Auditorium, Manville, New Jersey.

Comments will be summarized and responses provided in the Responsiveness Summary section of the ROD. The ROD is the document that presents the selection of a response action. Written comments on this Proposed Plan should be addressed to:

U.S. Environmental Protection Agency
Rich Puvogel
290 Broadway, 19th Floor
New York, New York 10007 -1866

EPA may modify the preferred alternative presented in the Proposed Plan and the EE/CA based on new information of public comments. Therefore, the public is encouraged to review and comment on the alternative explained here.

Table 1
List of Target PAHs

PAHs	
1	Naphthalene
2	2-Methylnaphthalene
3	1-Methylnaphthalene
4	Biphenyl
5	2,6-Dimethylnaphthalene
6	Acenaphthene
8	Dibenzofuran
9	Fluorene
10	Phenanthrene
11	Anthracene
12	Carbaxole
13	Fluoranthene
14	Pyrene
15	Benzo(a)anthracene*
16	Chrysene*
17	Benzo(b)fluoranthene*
18	Benzo(k)fluoranthene*
19	Benzo(e)pyrene
20	Benzo(a)pyrene*
21	Indo(1,2,3-cd)pyrene*
22	Dibenzo(a,h)anthracene*
23	Benzo(g,h,i)perylene

* = Carcinogenic PAH (CPAH)

Table 2

Maximum Concentrations of PAHs found in Lagoons and Canals

Location	TPAH (ppm)	CPAH (ppm)	BAP Equivalents (ppm)
Lagoon A	77,363	5,838	1,862
Canal A	21,206	1,315	357
Lagoon B	83,280	12,390	2,548
Canal B	21,417	2,135	595

APPENDIX B

PUBLIC NOTICE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY INVITES PUBLIC COMMENT

on the
Proposed Cleanup
Federal Creosote Superfund Site
Town of Manville, Somerset County, New Jersey

EPA announces the opening of a 30-day public comment period on the Proposed Plan and the Engineering Evaluation/Cost Analysis (EE/CA) Report for a cleanup strategy for the first phase at the Federal Creosole Superfund Site located in Manville, New Jersey. This early action addresses the cleanup of the highly-contaminated source areas, the canal and lagoon areas of the Claremont Development, a residential community of single-family homes. As part of the public comment period, EPA will hold a public meeting on May 12, 1999 at 7:00 p.m. at the Weston School Auditorium located on Newark Avenue, Manville, New Jersey. Members of the community are invited to attend and provide oral comments to EPA officials.

As the lead agency for the site, EPA conducted an EE/CA to evaluate cleanup options for only the lagoon and canal source materials first because these areas are the major sources of soil and groundwater contamination in the Claremont Development and therefore pose the greatest risks to human health and the environment. The EE/CA Record located at the Manville Public Library, 100 South 10th Avenue, Manville, New Jersey and at EPA's Superfund Records Center, 290 Broadway, 18th Floor, in New York City.

Based upon the results of the EE/CA, EPA prepared a Proposed Plan which describes the cleanup alternatives and provides EPA's rationale for recommending a remedial alternative for this first phase. EPA evaluated the following alternatives:

Alternative 1: No Action

The National Oil and Hazardous Substances Contingency Plan requires EPA to evaluate a No-Action Alternative to establish a baseline for comparison with other remedial alternatives. Under this alternative, no further remedial action would be taken to address the source areas.

Alternative 2: Excavation and Off-Site Incineration

Alternative 2 includes the excavation and off-site thermal treatment and off-site disposal of source materials associated with the lagoons and canals. It also includes acquiring and demolishing an estimated 10 to 19 houses in the Claremont Development and permanently relocating these residents. Also, residents on other affected properties may require temporary relocation during the cleanup. The source materials would be transported for off-site thermal treatment (incineration) and disposal. Excavated areas where houses were demolished would be completely backfilled, revegetated, and restored as open lots.

EPA and the New Jersey Department of Environmental Protections (NJDEP) recommend Alternative 2. This preferred alternative would provide the best balance of overall protection of human health and the environment, compliance with applicable or relevant and appropriate requirements, and reduction of toxicity, mobility, or volume of contaminants through treatment technology. EPA and NJDEP will select a final remedy after review and consideration of community concerns received during the public comment period.

The public comment in person at the public meeting and/or may submit written comments through June 1, 1999 to:

Rich Puvogel
Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, New York 10007-1866

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY EXTENDS PUBLIC COMMENT PERIOD

on the Proposed Cleanup Federal Creosote Superfund Site
Town of Manville, Somerset County, New Jersey

EPA announces an extension of the public comment period on the Proposed Plan and the Engineering Evaluation/Cost Analysis (EE/CA) Report for a cleanup strategy for the first phase at the Federal Creosote Superfund Site located in Manville, New Jersey. This earlier action addresses the cleanup of the highly contaminated source areas, the canal and lagoon areas of the Claremont Development, a residential community of single-family homes.

As the legal agency for the site, EPA conducted an EE/CA to evaluate cleanup options for only the lagoon and canal source materials first because these areas are the major sources of soil and groundwater contamination in the Claremont Development and therefore pose the greatest risk to human health and the environment. The EE/CA Report and all information related to the cleanup are available in the Administrative Record located at the Manville Public Library, 100 South 10th Avenue, Manville, New Jersey and at EPA's Superfund Records Center, 290 Broadway, 18th Floor in New York City.

Based upon the results of the EE/CA, EPA prepared a proposed Plan, which describes the cleanup alternatives and provides EPA's rationale for recommending a single alternative for this first phase. EPA evaluated the following alternatives:

Alternative 1: No Action

The National Oil and Hazardous Substances Contingency Plan requires EPA to evaluate a No Action Alternative to establish a baseline for comparison with other remedial alternatives. Under this alternative, no further remedial action would be taken to address the source areas.

Alternative 2: Excavation and Off-Site Incineration

Alternative 2 includes the excavation and off-site thermal treatment and off-site disposal of source materials associated with the lagoons and canals. It also includes acquiring and demolishing an estimated 10 to 19 houses in the Claremont Development and permanently relocating these residents. Also, residents on other affected properties may require temporary relocation during the cleanup. The source materials would be transported for off-site thermal treatment (incineration) and disposal. Excavated areas where houses were demolished would be completely backfilled, revegetated, and restored as open lots.

EPA and the New Jersey Department of Environmental Protection (NJDEP) recommend Alternative 2. This preferred alternative would provide the best balance of overall protection and the environment; compliance with applicable or relevant and appropriate requirements; and reduction of toxicity, mobility, or volume of contaminants through treatment technology. EPA and NJDEP will select a final remedy after review and consideration of community concerns received during the extended public comment period.

The public May Submit written comments through June 25, 1999 to:

Rich Puvogel
Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, New York 10007-1866

APPENDIX C

PUBLIC MEETING TRANSCRIPTS

SUPERFUND PROPOSED PLAN

FEDERAL CREOSOTE SITE

MANVILLE, NEW JERSEY

Public Hearing

Held at the Weston School Auditorium

Wednesday, May 12, 1999

7:00 P.M.

SCHULMAN, CICCARELLI & WIEGMANN
CERTIFIED SHORTHAND REPORTERS
EDISON TOMS RIVER ATLANTIC CITY
(732) - 494 - 9100

A P P E A R A N C E S:

PAT SEPPI, U.S. EPA
Community Relations Coordinator

JOHN PRINCE, U.S. EPA
Central New Jersey Remediation Section

RICH PUVOGEL, U.S. EPA
Remedial Project Manager

MARK MADDALONI, U.S. EPA
Risk Assessor

ARTIE BLOCK, ATSDR
TOM MIGNONE, ATSDR

MAYOR ANGELO CORRADINO
COUNCILWOMAN ALJEANETTE D. ZEMANEK
COUNCILWOMAN SENGA ALLAN
GARY P. GARWACKE, P.E.,
Administrator & Engineer

MAYOR CORRADINO: Good evening, everyone. I want to thank everybody for taking time out of their busy schedule and coming out on this gorgeous night. As we know, we're all here for the same reason, to find out exactly what's going on in the section where you live. And before we start, I'd like to make a brief introductions. We have our two Council people, Aljeanette Zemanek and Senga Allan. We have Lynn Giovanni, who's been with us since day one of the problem from Bob Frank's office, so Linda thanks for everything. We appreciate it. This meeting was called, I guess, in March. Am I right, Pat?

MS. SEPPI: Yeah.

MAYOR CORRADINO: We were told that we had to have a public hearing on the Superfund Site and, hopefully, we'll get some more information about what's going on. So Pat can update us on where they are and where they're going. So Pat, if you don't mind.

MS SEPPI: Thank you, Mayor. I

want also want to thank you for coming out this evening and apologize to the people who were here in March because a lot of what you hear tonight is going to be similar to what you heard that night.

AUDIENCE MEMBER: Who are you?

MS. SEPPI: I was going to get to that in a second. My name is Pat Seppi. I'm with EPA. I'm a Community Relations Coordinator and I've also been involved with the site since the beginning and all I wanted to do before I introduce anybody else here, sorry that you're going to hear information lot of you have heard before, but as the Mayor said, this meeting is mandated by law as part of the Superfund process. Let me go to the other people who are from EPA. Rich Puvogel is the Remedial Project Manager. John Prince is the Chief of the Central New Jersey Remediation section. Mark Maddaloni is a risk assessor. Jim Hackler is also with EPA. Michael Sidak is a risk assessor for EPA. We also have two other familiar faces. Artie Block and Tom Mignone from ATSDR.

AUDIENCE MEMBER: How much is that in salaries?

MAYOR CORRADINO: Let's keep the meeting to the purpose we're here for.

MS. SEPPI: Thank you, Mayor. So the reason that we are here tonight for this proposed plan meeting is to take your comments and your questions on our proposed plan which tells you what we plan to do, what we'd like to do with two lagoons and the adjoining canals that are in the Claremont Development. If you live in Claremont, you should have hopefully received a copy of this proposed plan in is your mailbox. There are some additional copies out back. I understand they may be all gone, if somebody doesn't have one and would like them, please come and let us know. We'll make sure that you get one.

So as I said, this is a mandated meeting. It's a little bit different than the meetings that we've usually had with you, whereas it's more formal. If you'll notice, we have a court reporter here who will be taking everybody's questions and comments and make it part of the public record. We're being a couple weeks into right now what we call the public comment period also reflected in your proposed plan. The public comment is your time to share concerns and comments about what we've presented in this plan the last night January 1st. Tonight everybody's questions and comments, as I said, will be taken down and transcribed. However, if you would prefer to give written comments, it's not a problem. They would be addressed to Richie and his address is in the Proposed Plan. Okay. The only other thing I would ask about this meeting, because it is a little bit more formal, we do have a couple of short presentations. Right, short presentations. And if you could hold your questions and thoughts until after that, I would appreciate it. Usually in a more informal setting we sort of just go through that. If you could just allow us to do our presentations, we'll be here to answer any questions and address any comments that you have.

Now, one thing that I have mentioned before is, and I did want to mention again, tonight is the ability of a qualified citizens group to receive a Technical Assistance Grant which is offered by EPA. What it does is provide funds for a group who's affected by this site to hire independent technical advisors to help them interpret any of the documents, site-related information that we will be showing to you. And community involvement is an important part of this whole process, especially from now on where we're going to be getting into the relocation and the designs and construction and a TAG is a good way to become involved. So we're going to be talking about this more with our community advisory group which is just one other thing I wanted to mention. We do have a community advisory group now. We meet pretty much on a monthly basis. We're going to continue to do that. My only concern with that is most of the people who are in that group right now are the people who are directly affected by the relocations, either the permanent buy out or the temporary or permanent buy out, whatever it may be. I would certainly like to get a lot more people in the rest of the community involved because as things proceed with the construction, we'll find a lot of things that are going to be of interest to everybody. So I'll be sending out flier to everybody in the next couple of weeks with a date for the next meeting and if we could get more people involved, I think that would be very helpful for everyone.

Okay. So I think at this point I'll turn this over to John Prince. He's going to talk very shortly about the Superfund Program.

MR. PRINCE: Thank you, Pat. I'm going to speak briefly about how the Superfund process was developed by Congress for EPA to implement. And then Richie will describe the plan for first phase of what we think be a multi -- several stages of cleanup to address the problems associated with the Federal Creosote Superfund Site.

Congress wrote the Superfund law initially in 1980 and it's really meant to address sites like this one, a long forgotten industrial operation that got redeveloped into a number of different uses, primarily residential where there are some -- many concerns of residual contamination and clearly something should be done. That's exactly where Superfund is meant to step in. The Superfund process really acts on two levels. The first sort of response is typically called a removal action. And it addresses emergency actions, spills, and imminent threats to the public or threats of releases into the environment. Once those immediate hazards are addressed, the remedial process begins and that's what this -- that's what we are all apart of in EPA. The remedial process is meant to take a look at a number of different types of things, but in a more broader way to know the limits of any potential contamination, to find out any potential problems that might be associated with the site and then figure out how to address them.

This site such as this being qualified for and this one has qualified for its national priorities list, which is the Superfund list. There are about 1,500 sites across the country that are, I guess, they're the ones that pose the biggest concern and are being addressed through the Superfund Program. Once a site is on the national priorities list, it qualifies for this remedial response which involves investigations to figure out what the extent of the problem is and funding where necessary to address those problems. Before remedial funds can be expended to address a problem at a Superfund site, EPA and the state, in this case the State of New Jersey, need to go through and be confident that we really know two things: That we know the extent of the problem or in this case a portion of the problem posed by the site and then that we're confident that we have a remedy that will address it and that it's, therefore, a good use of public funds and the right remedy for this site. When that is done, we prepare a k proposed plan which has now been released. We bring it to the public. We request your input in that process. At the end of the public period, in this case on June 1st, we will evaluate all those comments and determine whether any of them merit changes in that proposal and it has happened where the input from residents or people in the community have highlighted something that we were not focusing on that have changed remedies. So it's an important part of the process.

After that has been evaluated, EPA with the State of New Jersey, formalizes the remedy in something called a Record of Decision, which we are expecting to issue for this site in July of this year. It will very clearly state what the plans are for this first part of the site which will address the canals and the lagoons. The Record of Decision provides a road map on how the remedy should be performed. Then EPA goes back out and goes back to the drawing board and draws up what we call a Remedial Design, which is similar to the plans and specifications you wculd expect for any large construction project like the construction of a bridge or building. The scale of this first action that we're contemplating is very large and so that's the next phase. And then from those plans, from that design, we execute a remedy. Then after the remedy is complete, the site can actually come off of eventually the Superfund list. So that's the process: Identify the site, evaluate it and investigate, proposal, public input, select a remedy, design it, implement it, take the site off the list and a site like this, which is very complicated, we're actually looking at addressing the site in we think three phases. The first one is focusing on the most highly contaminated areas; the canals and lagoons within the Claremont Development. The next phase, which we will be going through this process again for other homes in the Claremont Development, the remaining homes, to figure out exactly what to bring a proposal to you again as to how to address those houses and then the last phase would be addressing some other things such as possible ground water contamination, possible other commercial properties in the area that might be contaminated. That is coming later, though. Right now we're focusing on the residential area where we know about a problem that needs to be addressed.

I'm going to turn it over to Rich Puvogel, the site manager, and Richie will go into some details and have some historical background about what we are actually planning on doing.

MR. PUVOGEL: I'm going to talk to you pretty briefly. My talk's broken up into three parts. First I want to talk to you about the history of the site. Some have you have heard it before. I have a couple historical aerial photographs that kind of give it a little bit more insight from the creosote was run and where certain parts of the facility is located, treatment areas and such. The next part of my presentation we're going to give you a broad overview of what EPA's doing out at the site and the approach to the investigation what we're looking at. And the last part of my talk is going to be focused on what we are doing in the canal clean up proposed plan we're bringing to you tonight. So briefly let me start with the history of the site.

Federal Creosote Site started operations about 1910, 1911. They started in there what is known as the Claremont Development. I have an aerial photograph here of what the site looked like in about 1954. You could see -- let me fish out my laser pointer. For several site features, over here this is the Johns-Manville site just to get you oriented. Just down here is Lost Valley. This road here is Main Street. Here is the beginning of East Camplain Road and about 1954 it stopped right about there. Several prominent features of the site are the wood that's been stacked up to be treated. This lighter color wood that you see here, that's untreated wood ready to be treated at the site. This wood would be put on rail cars and end up in the treatment facility down in this corner of the site. Here you could see there are some tanks and treatment building where the wood was loaded in and treated with creosote. After the wood was treated, it was rolled out on rails into this area right here. This is what we call today the drip area. The treated ties were left out there to dry off and some of the Creosote has dripped from the ties onto the ground. That's what that black staining area is from. Here you could see a row of treated ties right about Here.

Two other prominent features on the site are what we call today Canal A. This is A. This distributed the creosote from the production area to this lagoon where it ended up and deposited there. This is what we call Lagoon A. It's up in the northern part of the property or the development. Down in the southern end along East Camplain Road we see another canal here. This runs from the treatment facility down to the south and eventually into the larger lagoon, which we call Lagoon B located right here. You could see this feature, dark area. The facility ran until about the mid 1950's when it was dismantled, taken apart. By about the early ‘60s we start to see some development in the area. The first houses or the Claremont Development start to show up. This would be Valerie Drive right here and Louise. At about this point in time we don't see the lagoons and canals anymore. We believe that what we have for now with the borings we've done, these areas are now buried. This will be Lagoon A. Down in this area Lagoon B. The canals are also buried by this time, is how it all started. And development went on until about the mid ‘60s, I believe, until it locks like pretty much this. This is an airplane shot in 1975. You could see the Johns-Manville property still up and running, but this gives you an idea of the Claremont Development, 137 single family homes. Most of you know that, since you are living there today. This is the Rustic Mall area.

Today up here you have the Walmart shopping area, Arbey's, McDonald's.

Pretty much that's the history of the site. It closed down in the mid fifties and development went pretty quickly after that. That's about a brief overview of the history. I just wanted to give you an idea where things were located in relation to what the property looks like today, just wood treatment facility with the tanks were over in this area in the previous photo in 1963 that you saw. They were dismantled at that time and taken away. The lagoons up here and here in the drip area, north of Louise Drive around here. That's just a little bit on the history.

And I want to go next in the second part of my talk about what we're doing and what we're looking at so to address the problems that are left behind by that facility. We have a bunch of investigations going on at the same time or part of one large investigation. The first part is, obviously, the lagoons and canals. we're looking at -- we’re focusing on the worse place first. As John said, the lagoons and canals are areas that we still find the pure creosote left there. They were not removed before the developer put these houses in this development is one of the things about the lagoon and canal or excuse me. The next area that we're looking at is the sitewide soils. When this developer built these properties, we weren't sure whether these lagoons or canals or parts of them were moved into other areas before he developed it. These aerial photos show some pictures of what the place looked like when the facility was active. We don't have a good idea, we didn't further on, have a good idea if these features were still there. So we did some investigation into lagoons and canals. We found, yeah, they're still there. They didn't move them. They're simply buried over. We're doing an investigation now for the remainder of the Claremont Development, other properties that aren't affected by canals and lagoons. We've taken over 200 deep boring samples, some as deep as about 36 feet, to find out if there are other source areas around the development. Those results, we're getting analytical results back. We should have our results back to you by July. We want to try and get these results to you as quickly as possible. We have quite a number of samples, 1400 samples for different analyses for each boring. So it's quite a lot of work, but we're working to get it to you as quickly as we can.

Another phase or aspect of our investigationthat we're doing right now is the ground water investigation. You might see drillers around the neighborhood and in the past working on some holes or wells that have been in place in the community. We're establishing a network of about fifty-five monitoring wells throughout the community and up in the Walmart Shopping Center down Lost Valley to surround this site with a network of monitoring wells to see what's going with the ground water. So far we've tested the municipal wells. They're not affected by this creosote.

We're also looking at the surface water. We've taken samples on the Mill River cr the Millstone River and the Raritan River. We've taken surface water samples and sediment samples. Now Harry Allen back about a year ago, some of you might know Harry, he's the ERT specialist or Environmental Response Team. He's done some sampling on the Raritan River. We've sampled sewerage outfalls. There's slight levels of PAH's or creosote components in the sediment, but we didn't find any in the surface water. We're looking at additional samples, taking additional samples in the Millstone to determine the extent of that problem. Last part of the investigation or another part of the investigation that we're doing right now is we're looking into responsible parties, seeing if we could find who's responsible for leveling this in the way. It's what we usually look for to get responsible parties to the book to contribute towards some of the work on the site or at least contribute to the cost that we spend in cleaning up the problem.

The third part of my talk, just briefly going to go into the lagoon and canal proposed plan. We're going to talk about a few of the components of the plan what we're going to do. Plan is to excavate the material that's left in Lagoon A and Lagoon B as well as both canals. Right now the materials in the northern lagoon, Lagoon A, is approximately about 12 to 15 feet in depth. The material down in the bottom lagoon, Lagoon B appears to be about 25 feet deep, between 20 and 25 feet deep and is a much larger area. The total amount of material we're looking to excavate is approximately 44,000 cubic yards. What we do with the material once we excavate it would be to take it off-site to a incinerator to have it destroyed. Cost for this proposed plan is estimated to be about $58 million. The proposed plan that comes to you tonight, as John says, is part of the process of the Superfund. This is our proposal. You know, it's subject to public comment. We'd like to hear you. You know, any questions you have and try to answer them tonight. They're a lot of uncertainties at this point of how the work is going to get done. Those are questions that we're going to do or look at and try and solve in the design phase of the project. What we're trying to do to move things along pretty quickly is we're trying to get a design team together right now to take a look at this problem in the canals and lagoons and tell us how we can address these problems in an expedited fashion. We're also at the same time looking trying to start the relocation process for the homes that are located on Lagoon A and Lagoon B. The properties in yellow, those residents will need to be permanently relocated. We'd like to buy their properties and they would then move out so we could begin work. Work could not begin until we could move them out.

The other houses on the pink dotted lines and in pink are houses that are located either have a portion of the canal located very close to their house or underneath portions of their house. These properties we don't know yet what we can do with them. Our hope is we can save the houses. The last thing we want to do is take out houses unnecessarily if we don't have to. We'll make every effort to save them. Those are about nine houses we'll have sampling results in July that will give us a better picture on how deep the canal contamination if it lies beneath portions of the house or not. We'll look at that information and provide it to the homeowners. We'll also have, if we could start, hopefully, we'll have shortly after that design our engineers look at the situation as well to determine whether the homes can be saved.

On the relocation process, we think from where we're standing right now the relocation process or the temporary, excuse me, the permanent relocation folks, it's going to take about nine months to a year to do the title searches, the deed, pull the deeds, do appraisals, negotiate, come to contract, and get possession of the properties. In that time we're going to be concurrently working a design around designing the cleanup of the canals and lagoons. When we get it, as we move along with the design for the canals and lagoons, what we'd like to have happen is get the rest of the information for all the other properties on the Claremont Development. Once we get that information on the rest of the Claremont Developments and make some decisions on what needs to be done on the Rest of the remaining properties, we'll feature that information into the design while we're working on the canals and lagoons and see how we can address the whole development as a whole. Work would not begin until we know the situation with the rest of the properties in the development.

That's about all I have to say right now about this aspect of the project.

MS. SEPPI: Thank you. And now we'd like to open up this to questions and comments, but just a couple of things I'd like to ask, because we do have Darlene, our court reporter here, we would like you to come up to the microphone, please, to make a comment or ask the question and if you could state your name and maybe spell it for Darlene, that would help, just so she could get it correctly down for the record. Okay? So Angelo?

MR. MARUKA: Wait your turn. Name is Maruka, 38 East Drive. I got a plan better than that. You offer everybody $150 thousand. That will cost you 22 million. If the people want to move out, fine, but if they stay after you're done, they have to pay you 100,000. That will get you back ten million on the 22 million. You could do what you want with the rest of it. It's only random. They're going to dig two holes. Now you're talking about ground water and everything else. I worked at JM. You have a mountain at asbestos at Gusher field that's leaching water into the Raritan River and has been leaching water into the Raritan River for 50 years and nobody's saying anything. You built Walmart on the same property and all you did was what we did at Claremont, you buried it. Now I don't know what the problem is. What is Walmart going to have the same problem 30 years from now? Everybody's been living in the development for 35 years there hasn't been a dead cat seen on the property and I find this here overkill. Thank you.

MR. ALESANDRO: Jim Alesandro. I live on Florence Court. I'm want to address the map that you have displayed on the overhead.

MR. PUVOGEL: Yeah.

MR. ALESANDRO: According to what was being read on page eight of one of your handouts, it says the following: During excavation of the lagoon, it is anticipated that portions of East Camplain Road may need to be closed to provide for construction equipment. Okay Florence Court, okay, as a result of residents of Florance Court and some residents on East Camplain Road may need to be temporarily relocated. According to what you have on the overhead, we're not part of that relocation. Also, if you look on this handout you gave us, this is, you know, this is describing our lives as little more than a footnote. Okay. which is if we get relocated, I mean that's going to tremendously impact our lives over here. So I'd like you to comment something about that.

MR. PUVOGEL: The area in pink shows homes that are directly affected by the canals. The area in pink shows the purpose of those areas that are colored pink was to show the homes. The purpose of the map and coloring the areas in to pink was to show those homes that are directly located either abutting or on the canals. For the areas in Florence Court where's it's mentioned in the proposed plan, that's part of the proposed plan, these may need to be relocated. That's a question we're going to have, we're going to address in the design. The intent is to minimize the inconvenience to the residents as much as possible. There's a lot of working going to be going on. We don't want to relocate people unnecessarily. We'll work around this as much as possible, but what we're saying is that it might be a possibility, we don't know yet, until the folks who get the design done, designing engineers give us those answers.

MR. ALESANDRO: The reason why we're being relocated is that because of placement of construction equipment?

MR. PUVOGEL: No. It's primarily because the road may be closed at a certain time. You might not have access to your house.

MR. ALESANDRO: Even if the road is closed, why can't we park on another street?

MR. PUVOGEL: That would be fine.

MR. ALESANDRO: We'd like to work with you on this.

MR. PUVOGEL: Oh, no, we'd like to work with you. By all means, if you want to park around the block and walk to your home, we could make --

MR. ALESANDRO: We could save the federal government a lot of money.

MR. PUVOGEL: The last thing we want to do is move you out of homes unnecessarily.

MS. SEPPI: May I? Temporary relocation is a voluntary program. We would not force anybody to move out of their home even temporarily. The only reason is to try to make it less intrusive to your life. It's very traumatic to move temporarily. I've been doing this for the agency for a long time. If we could work around it and could have you stay there and you're willing to put up what you're probably going to have to put up with, that's fine. We just want you to know this program is available for people who may not work during the day, who may be home, who may not be able to stand the noise and everything else that occurs.

MR. ALESANDRO: That's all we ask.

MS. SEPPI: That's why we don't have all the homes that we may or may not have to temporarily relocate without a design. We really don't know which homes are going to be at this point.

MR. ALESANDRO: So I could say on the record there will not be no forced relocations. East Camplain Road and Florence Court where it's not highlighted in terms of --

MS. SEPPI: We won't force anybody to relocate temporarily.

MS. KRAUS: I'm not using the mike. I have a very loud voice. To the flying dust that this is going to create, we're going to get that fugitive dust that you mentioned in the report that you sent to us. That could be contaminated or not. It will settle all over our homes and then if we open the window, we can inhale it and get very sick. I would like to suggest that when this is all over and before we come back to our homes, if we get relocated, to powerwash the houses near the construction site to get rid of that dirt and dust that's going to accumulate all over the place. Could you do that?

MR. PUVOGEL: First what we're trying to do is to control the dust first and control any emissions from the site is take whatever any precautions necessary to stop that happening in the first place. Whether you saw mention in the proposed plan is talk about a prefabricated structure. There may be other ways to control this dust that's going to be emitted and that's certainly an option that we would explore if your house showed to have dust on it, that we would clean it off.

MS. KRAUS: You're saying that that much dust will be generated when you start the construction?

MR. PUVOGEL: Yeah. We try to minimize that as much as possible. We don't want this stuff -- we're trying to protect, you know, human health as much as possible. Dust is a concern as well as the odors. So we're going to try and control them as much as possible.

MS. KRAUS: When you demolish the homes right there, you're going to have dust. It might not be contaminated dust, but it is going to be a lot of dust.

MR. PUVOGEL: Right. There are engineering ways we could control the dust to simply one wetting the area down before demolition, but no, we'll take that into consideration in the design.

MS. KRAUS: If the dust is a lot, even if it isn't, will you wash the homes? You know, you have that powerwash that they use. Hire somebody.

MR. PUVOGEL: What we can do, we could look into that and see if we could do that. We first want to know that if it's a real problem, we'll take a sample. We'll take a wipe sample. If we see it's visually there, we could do that, too.

MS. KRAUS: Thank you.

MR. PUVOGEL: Any other questions or comments?

MS. MANDERSKI: Theresa Manderski, Valerie Court. Actually, it's going to take a year or eighteen months for your title search and deed searches. So we're talking about eighteen months before you start. Once you start, is there a specific hour of operations while you do this? I mean we have to work. We have to get our kids to school. We have to make arrangements for our lives. We're not going to relocate, you know, some of us do have canals in our backyard. We're not part of the pink or the temporary relocation. So I guess it's along our back fence lines or along the road. What happens to our pools, our sheds or fences? I mean that's all on the fences when you are going to come in. I'm not taking off six months vacation so you could do my backyard. My boss is not going to let me do that.

MR. PUVOGEL: For those areas where those kind of materials are, pools or shed are in the backyard that we need to excavate that area, we're taking those sheds and pools and if they're in the area of the excavation, we would pretty much demolish them and give you new sheds and a new pool. As far as they're at the area on Valerie Court where the exit trench is up north where it comes out east of the lagoon, again, relocation isn't -- what hours are you going to be in there? Are you going to be in there at 7:30 in the morning? Are you leaving at five? Are you coming in on the weekend?

MR. PRINCE: It's typical that we do construction basically five days a week. Five days a week during normal construction hours. So basically seven to five. Now, let me make --

MS. MANDERSKI: Seven?

MR. PRINCE: Yeah. They start pretty early. Understand that one of the reasons why we have a community advisory group for this site is so that while we are developing the design over the next year for how we're going to address these areas, we can resolve some of these things. Do we have to close parts of the roads during the week? How do we work that out? When do the buses come for the kids? We do need to make sure there aren't trucks on the roads. Questions like that that we need to incorporate right into our construction plans. So that yes, all those questions need to be answered and that's part of the process. And there is definitely neighbor input to that.

MS. MANDERSKI: Thank you.

MR. BRZEZIENSKI: Ron Brzezienski. I'm here on behalf of my mother Helen Brzezienski. She supposedly has a -- 72 Valerie Drive - canal under the house. What is the possibility of just picking the house up off the foundation and moving it back whenever the work's done and putting the house back on the foundation?

MR. PRINCE: The EPA has experienced in residential communities where there is contamination that's actually under houses, have actually. undermining the house with essentially a new foundation, removing the contaminated material and then rebuilding a foundation underneath the house. That is another option instead of actually taking the house down.

MR. PRINCE: It has a lot to do with how deep the material is.

MR. BRZEZIENSKI: You

supposedly say the canal is like four to six feet down.

MR. PUVOGEL: In some areas it's deeper than eight feet. In some areas the canal varies.

MR. BRZEZIENSKI: I remember when they were bulldozing our foundation and around most of the houses. We did not see any creosote.

MR. PUVOGEL: That's a positive thing. We talked to you early on when we were taking samples on either side of your mother's house to see how deep the creosote is. If it's below the footings and such, that will give us a better idea what we're in for as trying up around the house.

MR. BRZEZIENSKI: That's a possibility of moving the foundation?

MR. PUVOGEL: Yeah. Yeah.

MR. STRAIN: Robert Strain. I live at 271 East Camplain Road. I live all the way at the end of that cul-de-sac there. If you're going to be doing all this excavating, all this stuff, how am I going to get to my house back and forth?

It's ridiculous for you to be closing the roads down. If there's ever a fire or somebody needed an ambulance, had to get in right away, there's no way that, you know, people are going to be able. I'm in the construction business. There's no way that you are going to have -- people are going to be able to get in and out of here. I think the gentleman that spoke before with giving an option to buy everybody for say $150,000 and then doing what you want with all the property here is a good idea.

MR. PUVOGEL: One of the things we're going to be looking at during design is how we could work around closing the roads. We don't want to shut off access to the community.

MR. STRAIN: You can't do that. People got to come and go.

MR. PUVOGEL: We realize that. So we're not going to shut the community roads off.

MR. STRAIN: I seen people work to see there's no way that you are going to be able to do it. You're not going to keep the dust out. You build a tent, how are you going to give up and work with machines in there? It's never going to work.

MR. PUVOGEL: We've done it at other sites. It's a lot slower.

MR. STRAIN: The people that live here, you're going to have to smell the smell of creosote. You smell what it's like when trains go and they're putting in new railroad tracks in. That smell people, are going to be getting sick from it. Am I right that people are going to be -- you know, you sit there and breathe that in constantly, you dig into that, it's not going to let off any fumes or anything?

MR. PUVOGEL: What we're going to do as we dig, try to control the odor as much as possible.

MR. STRAIN: A guy works on a gasoline main. They open the gas. The gas comes out right away. How are you going to get rid of that smell? The smell don't go away.

MR. PUVOGEL: Those are the

considerations we're going to take into the design. We'll try to work around it as best we can.

MR. STRAIN: Okay. Thanks.

MS. KRAUS: The temporary people that have to be relocated, do they find their own apartments or whatever or do you find it for them? And if you do, how much would you allow for the rent?

MS. SEPPI: Temporary relocation, if you wanted to, if you need to be relocated temporarily and you could find a place on your own, that would be fine. But what we'd like to do is get government leases for properties and then, you know, take the burden off you. That way we can handle it, that way we can pay directly to the landlord. Your name isn't on the lease for a temporary relocation.

MS. KRAUS: My name isn't on it?

MS. SEPPI: No, not if you have a government lease.

MS. KRAUS: But I live right there.

MS. SEPPI: I mean saying if you should have to be temporarily relocated, the government reabsorbs --

MS. KRAUS: Do you find us a place or do we find our own?

MS. SEPPI: Either way. If you can't find a place, we would certainly work to find one for you. What happened in past sites, the people, maybe a relative, has an apartment or something. They said was it all right to move there? We said fine, as long as that's where you want to go.

MS. KRAUS: There is a certain amount they would allow for rent?

MS. SEPPI: What we do in Manville, we base it on the average rent in Manville. That would be the parameters, that ballpark amount that you would be entitled to.

MS. MANDERSKI: I have a question on that. We have animals. We have small kids. We're used to living in three, four, five bedroom homes with full finished basements and all that entails. You are telling me average rent in Manville probably goes about what? I mean Manville, unfortunately, is on the cheaper side of rent. You could get a two bedroom apartment in Manville for like $750 a month. My $1800 mortgage, you are not going to fit into a $750 a month apartment with my two dogs, one of which is a pit bull and my kid. It's not going to happen.

MS. SEPPI: You don't have to temporarily relocate.

AUDIENCE MEMBER: Me too. My dog is now in any backyard.

MS. SEPPI: We've done this many times. We will work to find something that works for you, you know, if you had to go out temporarily.

MR. MARUKA: You keep saying we.

MS. SEPPI: I'm sorry.

AUDIENCE MEMBER: I asked if you had ever been relocated. That's all.

MS. SEPPI: No, I've been -- personally I haven't been and I now how traumatic an experience it can be for people. That's why we try not to do it if we don’t have to. But we would work with you if we had to do it and we would try to find you something that's comparable to what you have. That's all I could say to you right now. Hopefully, that won't become an issue for you.

MR. PUVOGEL: Any other questions?

MS. KRAUS: If the people choose to be relocated, not the permanent ones, the temporary relocation, do they have to put their name on a list? How does that happen? Is there a list?

MS. SEPPI: No. No.

MS. KRAUS: I'm right on top of the construction site across. I'm going to hear and smell everything all day long. We're home all day long. We're not working. We don't go to school or work. We're retired. Sometimes we go here and there, but I can't stay in that house and smell all that contamination, dust and having noise, noise plus. I cannot stay in that house. So if you have a list, please put my name on it. You know me.

MS. SEPPI: We don't have a list yet.

MS. MRZYGLOCKI: My name is Joan Mrzyglocki. I live 52 Louise Drive. want to know if I could make my garden. like fresh tomatoes.

MS. SEPPI: I think that's a question for you, Artie.

MR. BLOCK: Good evening. My name is Artie Block and I am a representative for the agency for toxic substances and Disease Registry. We're an independent environmental and health agency. That's a great question. It's actually one that was asked earlier when we first began our work here in terms of uptake or dose your vegetables get impacted by the contamination. And the answer is no problem. You can do whatever you want to in your gardens. Eat your vegetables, whatever you want to. There's no impact in terms of the contamination on this site. Now, on other sites, yes. Different hazards, but in this one, it's not a problem, folks. Enjoy your vegetables. Okay?

MS. MAZUR: My name is Joan Mazur. I live at 78 Valerie Drive and Pat knows I'm very upset over this. I do not want to move. I'm one of them. I'm sorry. Clean my house up, knock it down, but give me my stuff, my home back. And another thing, there was real estate the last time, too. They spoke to somebody in my family. Oh, your land is -- we can get your land for $55,000 and sell it for 80. I mean why can't I have my own land back? This is in a way discriminatory, too. I'm getting people saying they put a bid on it.

MS. SEPPI: Not us.

MS. MAZUR: Somebody.

MR. PUVOGEL: An independent real restate agent.

MS. MAZUR: This is America. Supposed to be.

MR. PUVOGEL: What we're trying to do is see if we could save those homes. The last thing we want to do is take the properties or remove you from your home.

MR. MAZLENSKI: James

Mazlenski, 107 Valerie. Pertaining to here with these houses that are going to be torn down in the yellow, why do you have to buy the land back? Why can't they just own the land, you knock their house down, clean up the site and just build them a new home? This way you don't have to, buy the property, sell it back to the bureau and somebody else bids on it.

MR. PRINCE: There has been on other sites arrangements like that where we basically compensate the property owner for the structures. They keep possession of the land. When we are finished, they may -- they own the land, they can sell the land, they may use that money to rebuild the house.

MR. MAZLENSKI: Are we going to get enough money to rebuild what they have now?

MR. PRINCE: That's the intent.

MR. MAZLENSKI: It's going to cost more for the same house to be built. It's going to cost more, so it's going to be out of their pocket?

MR. PRINCE: The way it has worked before was that the rate of compensation was such that they could build a house today on that lot of a similar size.

MR. MAZLENSKI: What if they don't want similar or they want the same or greater, not smaller?

MR. PRINCE: I'm implying not only the same size, but the same levels of finish, same number of bathrooms, finished basement, essentially the equivalent house.

MR. MAZLENSKI: Another question is with the smell and odor and everything, if people are getting relocated, the odor is going to be in their house. Now they got wall-to-wall carpeting. Are they going to replace all the carpeting in the house?

MR. PRINCE: We don't anticipate that the carpeting is going to be affected.

MR. MAZLENSKI: What if it does get affected by all these homes. All the odor is -- you ain't going to be able to control all the odors.

MR. PRINCE: When we typically relocate someone during the work, in other words, we have to sort of work right around their house, we also seal the house up.

MR. MAZLENSKI: Seal the house up? Now another question is people that you are going to be relocating, are you going to have any security there to watch their homes?

MR. PRINCE: Yes, sir. Yes. We also have 24 hour security while we do the sort of work.

MAYOR CORRADINO: You were talking about taking nine months to a year for the surveys and the negotiations and the buyout. When is that process going to start?

MR. PUVOGEL: We've already started the process. It's jumping the gun a little bit, the proposed plan hasn't - it's not finalized. We already started that process. The Army Corps of Engineers has been brought on board and has started to look at titles and deeds for these affected properties so that process already started.

MAYOR CORRADINO: When are you going to notify the homeowners? You are starting negotiations. You say you have to work from nine months to a year, then design the plan. Now you already know that these houses have to be bought out and in order that this has to be corrected, these are the lagoons. Why can't we start on those right away? Why can't you start negotiations with those people right now so we don't have to wait a year and half for this phase to be done?

MR. PUVOGEL: What we're trying to do is do two steps at once, negotiation with the people as the contract is being drawn up. The process of negotiation has to go through several steps. First have an assessor assess the property. Then we could start negotiations with the folks, Closing to contract. After that they have a certain amount of time that they've given to leave their homes.

MAYOR CORRADINO: As soon as

that process is completed, then you could start the cleanup in that area with phase one.

MR. PUVOGEL: What we need first is this Record of Decision. The finalized or formalized decision that we're making on the canals. Then work can begin. We're jumping the gun. We're starting the process of relocation now, but we get the real money after that Record of Decision is written that releases the funds so we could do this design work and that's the process of Superfunding provides an opportunity for public community which we're doing tonight and --

MR. PRINCE: Before we spend the money.

MR. PUVOGEL: Right.

MS. SEPPI: So you understand it's not nine to twelve months. We've done some of the relocation stuff already. The deeds and the title searches, we're in the process of getting a local appraiser on board to do the appraisals. That we can do before we have the Record of Decision.

Until we have that Record of Decision in July, we can't get into any kind of negotiations with any of the residents. You know, but once we have that Record of Decision and it's signed, then we could start meeting with everybody individually and getting into this relocation process. So we're not talking about-nine to twelve months for that. We're talking about two months before we could start doing that.

MAYOR CORRADINO: Once that's completed, that's when that phase is going to start? we've been reading it's going to take between four and six years to complete this. Now this four or six years, is this retroactive to two years ago when we discovered it, when DEP or EPA got involved or are we talking starting this from day one because this is -- that's quite along time for people to be displaced or their Lifestyles to be disturbed. I think we need to expedite -- I think we submitted a plan with local engineers where you could get it done in two years. That's my main concern. We need to get back to normal is for these people as quickly as possible and four years is just too long. I'm concerned about the other people, too.

MS. SEPPI: Do you have a question, sir?

MR. SAZZACHAKO: Stephen Sazzachako. I live approximately a mile and a half away from this development. Directly it doesn't affect me. Indirectly it may. There's an individual or two individuals here that are considered risk assessors. May I please have a definition of your position and what exactly do you work in the way of the statistics and the fine -- I can't find the right words. sorry, but please explain what you do.

MR. MADDALONI: Mark Maddaloni. Well, we look at all the data that was generated from the site and make estimates of any actual or projected health risks that we may suffer as a result of being exposed to this site and we did this. Many of you have come to me before. I should be familiar with your face and come up and explain about the nature of the surface soil assessments that we did. We have very conservative assumptions about how you might be exposed. That test, if you use soil, and people ingest small amounts, incidentally, every day, and we assume that you'll be in contact with that soil every day for a 30 year exposure period, that's the upper bounds of how much time we spend living at a house, we think then combine that with very conservative assumptions about the toxicity of chemicals. That polycyclic aromatic hydrocarbons, that's by-products of the creosote process. From that we could make, I think, very informed educated scientifically defensible projections about what kind of health risks are involved. And so I'll be glad to spend as much time as you need to satisfy your need to understand risk assessment.

MR. SAZZACHAKO: Basically your explanation probably put half of these people to sleep.

MR. MADDALONI: It's a little dry.

MR. SAZZACHAKO: What I'm

gearing for, we know as Manvillites what asbestos has done to the human body. What does creosote do to the human body?

MR. MADDALONI: Again, there is a lot of products from creosote.

MR. SAZZACHAKO: Very, very simply, what are we looking at?

MR. MADDALONI: We're probably most singly concerned with cancer causing potential of a group of these components, what's called the PAHs. They have been demonstrated in animal models to cause some types of cancer. They're not demonstrated human carcinogens, but they have been demonstrated in animal models. Bear in mind in very high doses. They are very different in some areas where we don't have equivalent like the four stomachs. The EPA takes a very conservative approach and treats any carcinogen as if it could be a human carcinogen. That's the main driving risk that is behind our trigger levels and clean up goals for this site. Cancer causing potential from a group of chemicals called PAHs, polycyclic aromatic hydrocarbons.

MR. SAZZACHAKO: Is anybody in danger of dying?

MR. MADDALONI: I'll get to that. Hold on, sir.

MR. SAZZACHAKO: Thirty-five years the Claremont Development has been there and many of those individuals have lived there since it was developed, actually bought the houses as brand-new. In turned there have been, of course, resales. Now, as a risk assessor, tell me after five years, after ten years, after twenty-five years, after fifty years, mortality rate, please.

MR. MADDALONI: I don't think anyone on earth can give you a precise answer to that. But we did look at the surface soils have been completely characterized. Now, the medium which are mostly in contact with and most of the homes probably about 120 of them had very low risk. That's what we projected would be less than one in 10,000 chance of excess cancer risk over a lifetime from being exposed every day to those soils. It's not zero. And we don't want to live with any risk. And I don't blame you for that, but there is, you know, small amounts of risk.

MR. SAZZACHAKO: You can't give me any numbers?

MR. MADDALONI: Less than one in 10,000.

MR. SAZZACHAKO: Less than one in ten thousands.

MR. MADDALONI: For almost all the properties.

MR. SAZZACHAKO: Over the course of how many years?

MR. MADDALONI: A 30 year exposure.

MR. SAZZACHAKO: Thirty year exposure. Approximately 137. Approximately forty-five. Theoretically, you're telling me you feel because it's one 1 in 10,000 I cannot see any mortality there, any mortality rates involving Creosote? I don't believe that. If we look at what we have the problem with asbestos where people never worked in Johns Manville, people actually lived 20, 30 miles away were exposed to clothes that had asbestos, we had mortality rates. I still think you know the answer to my question. I believe that you just don't want to tell us.

MR. SAZZACHAKO: I'm sorry, I can't disagree with you more. I couldn't disagree with you more. 58 million dollars to remediate, 44,000 cubic yards. How many dump trucks is that?

MR. MADDALONI: I'm going to have to pass that one off.

MR. SAZZACHAKO: Sealed? Unsealed?

MR. MADDALONI: Any other health questions I'll be glad to answer that.

MR. PRINCE: Sealed trucks departing the site and the trucks, namely 44,000, 40 yards a dump,20 yards a dumpster, 2,000 trucks.

MR. SAZZACHAKO: 2,000 truckloads?

MR. PRINCE: And then 2,000.

AUDIENCE MEMBER: 22, 000.

MR. SAZZACHAKO: Better Arithmetic than the federal government I see.

MR. PRINCE: That would be two yards a truck.

MR. SAZZACHAKO: Sealed.

MR. PRINCE: Sealed trucks. And I should also point out that we are taking all of this material out so we need to bring clean material in. So they're twice as many trucks that need to be involved in this process.

MR. SAZZACHAKO: Now sealed trucks. I don't know how you're going to pack these trucks without getting it on the tires and wheels and driving right through the community, but was that something you are going to have to worry about.

MR. PRINCE: Yes, it is.

MR. SAZZACHAKO: Now you mentioned construction time between seven a.m. and five p.m. Are these Federal workers? Are they private contractors? How many individuals? How many workers? How many trucks?

MR. PRINCE: We typically do this: all the clean up work is performed under contract to private remediation, environmental remediation firms that specialize in this kind of work, that have the specialized kind of workers that are needed to know how to remove this material. So it's typically a fixed price contract with the federal government performing the cleanup work.

MR. SAZZACHAKO: That's unusual. I love the way you answered the question. I was back there sitting with my wife. Every individual came up here asking you questions, I see some of the residence here laughing at you. Basically you are giving us no answers. Do you recall what I just simply asked you? How many workers? How many trucks? How long does it take? I would like to know. 58 million dollars, as far as I'm concerned, I'm willing to pay it. I've paid my taxes, so if these individuals are from other remediations throughout this country, how many workers? How many trucks? And how long? You never gave me an answer. You guys skirted right around it. You've been trained very well.

MR. PRINCE: Thank you. I will tell you that we do not have the answers to all those questions because we will --

MR. SAZZACHAKO: You should at this point. You should. It's unbelievable. I'm going to use something that I don't normally use. You people, that's basically a slur in a lot of places, you people have been working on this for so long, you don't even have the answers to simple questions like that? Mathematics, that's all it is. I'm not affected by this. I am not going to be dying from this. Half of these people probably will. I did not get that answer correctly from him. Risk assessment is basically risk mortality. How many people are going to die? Is that a statistic? That's it. Now, if you don't have that question, how can you possibly say that you are giving these people the necessary information they need?

MR. PRINCE: These are all questions --

MR. SAZZACHAKO: The court reporter is taking these questions and I assume that is probably going to be answered, if not in the papers, at least hopefully send me a copy of it. Tell these people what they can expect. Now your turn.

MR. PRINCE: Thank you. The process when we have questions at meetings like this that we cannot answer, is that we have recorded that for several reasons. One because we need to be able to memorialize any responses that we can't give, but also we need to document that we're all participating in this process that we're EPA's not going hell mell on some process that is unvetted by the community. That's not where we did not give the community an opportunity to provide their input. So yes, the Record of Decision that we discussed that formally says how EPA will perform this clean up, will have a section in it that will have all of these words and then we'll actually have written responses where our verbal efforts are insufficient.

MR. SAZZACHAKO: Thank you. Earlier you had mentioned that there are certain number of Superfund sites. I'm sorry, I missed that number.

MR. PRINCE: About 1,500 across the country.

MR. SAZZACHAKO: 1,500. How many are in residential areas?

MR. PRINCE: I don't know.

MR. SAZZACHAKO: I could tell you right now. One.

MR. PRINCE: Not true.

MR. SAZZACHAKO: This is what we were told. Then my information was incorrect. Because we have information here. Also that industrial sites takes precedent over residential sites. I don't know why. Because it would be easier to control or easier to remediate?

MS. SEPPI: That's incorrect.

MR. PRINCE: May I respond to that?

MR. SAZZACHAXO: Sure. Go ahead.

MR. PRINCE: This site affects -- we know where the plant was and we know where the ties were stored and we know where the canals are and lagoons are now located and we've done a lot of testing to characterize where that material is, not contaminated soil that might be spread around in other places, but really where the creosote residues are and our plan is to address that first. The actual facility is primarily under the Rustic Mall commercial area and we suspect that there's probably some contamination there, too. We have not gotten to that stage of our investigations yet. That's to come because we are focusing on what we perceive and I think what you all agree is what we should be addressing first, which is the residential area.

MR. SAZZACHAKO: Oh, without question, I agree. What about the Foodtown where we eat the food from?

MR. MADDALONI: That's a good

point. I notice on the plans it seems as though the Rustic Mall or parts of it are over some canals. Why subject the residents to the open soil, the possible contamination of their lungs and their homes, et cetera, and then have them return to the neighborhood and then work and open up the commercial area? Why can't you all do it at the same time?

MR. PRINCE: Well, we think that we're addressing the worst part of the site first.

MR. SAZZACHAKO: You're dancing again.

MR. PRINCE: Pardon?

MR. SAZZACHAKO: You're dancing again. Think of it, why do one and not the other at the same time? You're going to disrupt this whole town. Now, back to the next question. Realizing that $58 million and again, you don't know how many workers or how many trucks are going to be involved, you're figuring four to six years, two to four years?

MR. PRINCE: The four to six

time frame is more for addressing all of what we might find including possible ground water contamination, concerns about the rivers, some of the broader site issues.

MR. SAZZACHAKO: Now, four to six years, $58 million, “X” amount of workers, “X” amount of trucks, if you double the number of workers, double the number of trucks, you'll double the number of expense and you'll get it done in half the time. Have you thought of that?

MR. PRINCE: One of the issues that we need to work out in the design which is related to that is that there are two lagoons and it would be most disruptive, but quickest if we were addressing them both at the same time. However, we need to make sure that we can do that and allow for emergency services, regular lives to continue, and not cause too much disruption such that it becomes an unlivable place. So we need to weigh that decision. Do we do them both at the same time or do we do them sequentially and we need to work that out.

MR. SAZZACHAKO: In a sense you'd rather disrupt the neighborhood for four to six Christmases instead of two to three?

MR. PRINCE: It's an open question.

MR. SAZZACHAKO: Title searches, you mentioned six months.

MR. PRINCE: The estimate that we give is six to -- I'm sorry, nine to twelve months to perform the permanent relocations of the properties that need to be permanently relocated. That's from the start of the process until the last person is relocated. So some people might be out in a month and some people might be out in six months. Based on our experience at our sites where we have had to do permanent relocation, give that as an approximation of how long it will take to do the whole process.

MR. SAZZACHAKO: Now, who has the final say on this whole project? Is that Mr. Puvogel? Who has the final say in how this is going to be taken care of?

MR. PRINCE: The remedy decisions are made on a region wide basis. The EPA is broken up into ten regions. This is region two. The regional administrator is Jean Fox and she will ultimately be signing the Record of Decision which will be issued, which will say this is how EPA's going to address and perform this work.

MR. SAZZACHAKO: Thank you.

AUDIENCE MEMBER: Does anybody know how long it's going to take? When we are told by the EPA, two, three, five years maximum, now you are talking four to six after two years went by. Do you know how long it's really going to take or not?

MR. PUVOGEL: The lagoon/canal area we're estimating at this point about two to three years.

AUDIENCE MEMBER: Now the with four to six, you are talking about, I think the Mayor and the politicians, because they're going to speed this along and cut the time down, every time we come to a meeting, you add two more years.

AUDIENCE MEMBER: Creosote, isn't that kind of just like a natural process or byproduct of when you burn wood in a fireplace? If the wood has a high moisture content, is that what you get?

MR. PUVOGEL: That's true.

AUDIENCE MEMBER: Your readings could show, especially for a lot of people that have been burning wood fireplaces during the winter when you're -- during your excavations.

MR. PUVOGEL: There are background amount or man-made amounts of creosote that occur in the soils as part of a natural society.

AUDIENCE MEMBER: Oh, we breathe it every day to a certain degree, let's say if you have a house with a fireplaces, especially.

MR. PUVOGEL: Yes.

MS. PONGRAZZI: Rebecca Pongrazzi. I live at 23 Valerie Drive. Essentially, my home is not a buy out or potential buy out. I agree with a lot of things that have been said here where as homeowners we've lost the freedom to sell our homes if we choose to. I personally don't want to be here through this? My family owns an environmental company. Although you could put up tents and minimize the dust, it's still going to be a mess. There's going to be gigantic holes. You are talking 20,30 feet deep. It isn't going to be a friendly environment once you start tearing things up. You know, utilities are probably realistically are going to be accidentally hit and people are going to lose water, gas, things like that, temporarily. That happens. It's definitely going to be an ugly scene for a lot of people and I feel as though you should give the choice to the homeowners to have their homes bought out if they choose to because we've lost that choice as homeowners. We can't sell our homes at this point. And I feel as if you were to buy the homes and give us that choice, you are not going to lose that money because once it's cleaned up, you could resell it for the value that you bought it for or possibly higher. You have nothing to lose. If you own the property, at least it gives us the choice to leave if we choose to. The other question I have is I agree that we have gotten a song and a dance with our questions. The question about the garden, that was the first time I've heard a definitive answer that, yes, it is safe to eat our vegetables. I was told last year that while you were planting if you saw creosote, if you saw black residue, then it's probably not safe. I have done my own research on the internet on creosote and the components that make up creosote, and there's a lot of things in creosote, that seem very dangerous. I've read things about reproductive problems associated with some of the components. I've read something on breast cancer. I've read something on blood disorders. And I know you are saying that it's long-term health risk, but I mean it's a health risk period and there's people here. I would like to know definitively if it's safe for my ten month old daughter to play on my grass. My grass is in a drip area. I've never got a definitive answer. Is it safe? Everybody has small children and as parents, you love them more than anything. Would you let them crawl on this potentially hazardous soil? Yes or no?

MR. MADDALONI: The answers are not crystal clear.

AUDIENCE MEMBER: That's shit.

MR. MADDALONI: We use the best science that we have available to us. That's all we could use and sometimes there's just --

MS. PONGRAZZI: Do you have any kids?

MR. MADDALONI: I have two of them.

MS. PONGRAZZI: I want an answer.

MR. MADDALONI: When we delivered the soil to the risk assessor, we identified a couple of problems and you were each individually mailed where, you know, you had slightly higher levels. Nothing posed an immediate risk, but we said over the long-term based on -- based on what Congress has directed EPA to take action when cancers has seen certain levels, we have targeted certain homes for long-term remediation. I spoke to this group and I said there are not immediate hazards. I said you should -

MR. MADDALONI: My daughter, she can't play on the grass. A ten month old because you don't have an answer.

AUDIENCE MEMBER: Can she put her child out on the lawn? I heard her say, "Honey, get the butterfly. Look this at this butterfly." Can she or can she not do that with her kids with no risk, with no risk to her child?

MS. PONGRAZZI: I was told with my child as long as that child doesn't come in contact with the soil. You know, that's not realistic. Children are going to stick their fingers in their mouth after they touched the grass and play. They put dirt in their mouth.

MR. MADDALONI: Hold on. We have -- we have the kind of --

MR. BLOCK: I'll answer that. Again, my name is Artie Block. The answer to your question is yes, your child can play in the yard.

MS. PONGRAZZI: Would your child?

MR. BLOCK: Yes. You have to understand something about risk. Okay. What Mark talks about is, and toxicologists will do this, they need to look at numbers. Okay? Risk assessors need to look at numbers.

MS. PONGRAZZI: What about people? Look at people.

MR. BLOCK: You as a person, what do you see on top of, hopefully, on top of the dirt?

MS. PONGRAZZI: Grass.

MR. BLOCK: What does the grass do?

MS. PONGRAZZI: It covers the soil.

MR. BLOCK: One more question

or a statement maybe. This is what you call exposure. Okay? The level of exposure your child may have. If there is, in fact, if there is, in fact, contamination and there may be some contamination in the dirt, maybe one, two inches, three inches underneath, the reality of it is as your child is crawling over the grass, okay, hopefully most of it will be underneath. I cannot tell you, as Mark stated, that every little parcel of soil that your child may come in contact with will be contamination free. I cannot say that to you. Mark cannot say that to you.

MR. MARUKA: I can say it. We've been here for five years and they eat the tomatoes and everything else and nobody's gotten sick.

MR. BLOCK: Basically, sir, I think that's what Mark said, that the risk is very low. Okay? But the practical part of it, you and your child, have your child play on it. There's no problem with it. Okay. There is really no problem with it. And again, please let me repeat what Mark repeated because you need to understand, there is no immediate or acute health threat. The only time that you may get exposed to that type of level is if you go into those pools down there. That's where the acute and the immediate hazard is. Dermally, in your skin, inhalation, that's where. That's where the PAHs impact on you. okay. Overall, looking at -- and again, we are an independent environmental health agency and although we utilize EPA's data and consult with them and talk to them, we make our own call in ATSDR and that said you don't have an immediate and acute health threat. Yes, there is a potential long-term threat, but let's talk practicality. The practical issues are the exposure. The real issue here is how much are you exposed? I don't know if that helps.

MS. PONGRAZZI: If there, as you're saying, is no imminent health risk, why have we been put on the national priority list? What is the criteria for that? If there's no human health risk, how come we are on that? I mean I'm just curious.

MR. BLOCK: Okay. The one thing I'll reemphasize what you said is there's no health risk associated because of the exposure issue. All of this stuff is underneath. Okay?

AUDIENCE MEMBER: Why are we going through this?

MR. BLOCK: That's something EPA will have to answer. I can answer the health part of it. Okay?

MR. PRINCE: The Superfund Program is designed to address uncontrolled releases in the environment. It's a very broad term, but it essentially means when we don't know how extensive a problem is and we don't know where it might be popping up. It was put here, but it's coming up over there.

AUDIENCE MEMBER: He just told you that nobody's died in 35 years. How long do you want somebody to stay here? Seventy years before you're safe?

MS. PONGRAZZI: Everyone in my home prior to me has died of cancer. I'm not saying that it's this, but it has happened anyway.

MR. PRINCE: Fine. And I'm going to continue answering the question. The Superfund Program is designed to be available when surprises like this, unknown things like this come up and this, you know, this appeared to the State of New Jersey and then was shown to EPA essentially two years ago in 1997. And in those two years we've managed to determine the extent to which there is any imminent health threat. Because we didn't see one in the ground water, we didn't see one in the surface soils, we didn't see a concern that required that sort of immediate response, but then there is a -- there is an enormous amount of contaminated stuff down there. Listen. What EPA's program, what EPA's proposal here says, we think it doesn't belong in a residential community and we're planning on taking it out. That's our goal. Unfortunately, this is not simple. It's not simple for us. It's not simple for you to understand. And we're not going to be able to fully characterize and answer every question about it tonight. But part of the reason we're here so is that we can get this sort of feedback to know what you think. Do you want us to do this? Do you want us to leave?

AUDIENCE MEMBER: Residents are dying from this asbestos for 30 years and nobody did anything. They just died. They're dying. Now you make a federal case over creosote and everybody's been living on it for 35 years.

MR. PRINCE: We could continue formally responding to questions including yours.

MS. PONGRAZZI: If the creosote remains in the ground and there's no health to residents, what if say a commercial development would build on top of here and everything was paved over, would that make the problem go away or do you have to completely remediate the site either way?

MR. PRINCE: It is our -- it is our belief that no matter what happens, even if this were to become a commercial place, that these lagoons and canals would need to come out anyway and that's one of the reasons why even though we don't have the answers on all of the other properties in the Claremont Development, we know what's going to happen here one way or the other. We're trying to work it, you know, work it out so that it's addressed while you folks can still live there.

MS. PONGRAZZI: You mentioned that your picking up places of it in the rivers. That doesn't directly affect our water supply because we have our own water department, but Elizabethtown Water, which is probably the biggest water suppliers here, pulls out of that river.

MR. PRINCE: Sure.

MS. PONGRAZZI: Is it coming into there?

MR. PRINCE: Elizabethtown Water Supply, do you know a specific answer to that question?

MR. PUVOGEL: We've tested the surface water. The trace amounts we found are in the bottom of the river in the sediment. We've attempted the surface water. We don't detect anything in that surface water.

MS. PONGRAZZI: Okay.

MR. PRINCE: Plus Elizabettown Water is responsible to do testing and identify whether they are going to address that. They're in the business of doing that.

MS. PONGRAZZI: Right. Okay. Thank you.

MR. McGINNIS: My name is Ralph McGinnis. I live at 127 East Camplain Road. I guess everyone knows on the overhead here, I'm in the -- I'm on the pink in the lower left-hand corner, so I think everyone can appreciate that I'm here for the real deal. I'm not here to play around. I'd just like to say a couple of things to the audience, just for your information. There is a community group that we put together and Pat did say earlier about people coming out to it. You know, we get a turn out of maybe five or ten people, the latter one maybe had fifteen. Yeah, this is a good turn out. I know a lot of people are angry, frustrated and truthfully, the situation sucks, but we have to do something about it. It's not going to go away. Coming to one meeting and bitching isn't the way to get it fixed. Excuse me, I am speaking. If you could just hold your voice or your questions until I'm done, I would really appreciate it, sir. You know, the turn out, there are notices and again, the ability to talk with the EPA and have some ability to have direction into what we want to have done. She also brought up the TAG. The technical assistance grant that is something new that we needed to get people involved in. You know, this isn't going away folks and if it's three years or six years, you know, it's going to be what it's going to be, but we need people involved to make it the best it can be so we could get things done and the EPA can get their work done. And you know, just when you see these dates or times to come out, we'd really appreciate it and really it's volunteering your time. You're concerned about your quality of life. Well, you got to participate in part of it as well. You can't sit back and just talk amongst your friends. You got to get out and talk in these committees. I mean we've already spoken about some of these homes, the ones in the yellow, you know, does the borough buy them? Can the public buy them? Why not put, you know, you could make these homes a park. You know, there's a lot of options, but we just have to think about it. For myself, I just want to, you know, I've had almost all these people from the EPA, and ATSDR, they've been to my home one time or another. These are decent folks. They're not our enemy. I'm not trying to kiss up to them, but they're here to help us. You know, so it's -- they're not the enemy.

AUDIENCE MEMBER: Who is?

MR. McGINNIS: I guess as far as a real recommendation to this plan, I do question the plan itself because it was vague and some of the remedial action, whether you may lift a house, you may not lift a house, I thought this plan would have a few more concrete specification into how it's going to be remediated. thought it was weak in that regard. You know, there's still a lot of things that are up in the air about that. I guess the real recommendation for my plan where my property is, unfortunately, I'd like to see that turned to a yellow block. I don't want to run away from this, but the sampling you did on the side of my house to say well, you know, that's going to tell me if I got creosote under my property, under -- all right, underneath the house. You said it yourself, the canal varies. My house is approximately 50 feet wide across with the canal going through it, it completely -- you still can't take samples out outside and tell me what's underneath my house. Thank you.

MS. ZEMANEK: Counsel woman Aljeanette Zemanek. I've had a few questions from residences. They meet me different places in town. One of the areas we haven't really talked about is the drip area. And many of the residents in the community, like myself, are getting older in our lives and putting our life on hold for five years is a big chunk of what we may have left. Some of these families we're talking about, things that are general maintenance of their homes, they want new siding, they want new windows, they need new roofs. Do we go ahead? Do we spend our money that we've saved to put in our property or do we sit and wait for four years or six years or do we make those improvements, hoping that what we're going to get out, will compensate what we're doing. I'd like assurances for those people that are in those drip areas if they want to do something to their homes, should they move forward with their general maintenance? Should they take care of their homes or should they just say I have to wait six years to find out what's going to happen? Secondly, some of those families are people like myself, who at some point in time maybe before six years may want to move out of their homes. They may want to go to their dream home in Florida. But right now, they can't do that. And I think we have to look at that, if some people had those desires, that they have to be able to talk to someone and see if they do have a future, that they can go and seek a retirement before this is over.

MR. PRINCE: We'd like to respond to individual requests where possible, individual inquiries about particular properties. What I will -- and there is still outside of the lagoons and canal area, there is still some question in EPA's mind, which we plan on bringing back to the community this summer, the answers to those questions about whether there might be other houses that need to be removed to get this work done. What I can say today is that we know where the many canals are and we know where the lagoons are and the data to the extent on all the other lots to the extent that we have been able to look at it as sort of a big picture. Again, we don't have it all so we can't do that yet. It indicates that there aren't other areas of very deep contamination like this, in, for example, under the rest of the community or under many, many more houses there may be some more where some deep excavation work needs to be done. When that happens, then the issue of a permanent relocation comes up.

MS. ZEMANEK: So would you say the answer to my question is yes or no, should these people that are in the drip zones that are not pink or are not yellow continue to invest their money that they have saved to do their general maintenance? People are talking about new siding. Do I go ahead and put new siding on my home? Do I do those things or do I put my life on hold for five or six years and then decide?

MR. PRINCE: The people who live in the drip area should wait to hear our next meeting in July. We will be meeting with residents individually beforehand before that meeting and then we'll be having another public forum to do a broad presentation for all of those residents. So I'm actually recommending that they await those improvements.

MS. ZEMANEK: I know at least for two months I know there were families that were talking about selling and retirement. Right now you can't sell your home there. Your home is not going to sell if you want to move and go somewhere else. Basically even if you want to move out of your home and rent it, I don't know how easy that would be either and I think it's like many of us, and just looking around the room, when we start putting our life on hold for four, six, hopefully only six years, that may be a long time to some of us.

MR. PRINCE: Thank you.

MS. SEPPI: Just one second. Those are some really good points that you brought up and I appreciate those comments, you know, and I agree with John. Hold off until our next meeting in July.

AUDIENCE MEMBER: When?

MS. SEPPI: We don't know yet, but some time in July, probably around the middle of July. At that time this map that you see up here now will be revised. Maybe there will be some additional yellow homes on it based on what we find out from this next round of data that we're expecting. Maybe they'll be some additional yellow houses, but at that point if you know that your house is not going to be directly impacted by this, then I would say, you know, you go ahead and do what you want to do. So if you could just give us a couple more months, then you could go on and make any improvements that you want to make, as long as, again, your house isn't directly impacted.

AUDIENCE MEMBER: In answer to that gentleman's question, you've disrupted my life for two years and you are the enemy. You are the suit that's in front of me and I have to holler at you. If he doesn't think that he's the enemy, well, that's his business if he wants to play with me. And as far as this other stuff goes, we've been putting weed killer down, mowing lawns and everything else for 30 years and you can't tell me I shouldn't waste another fifty bucks trying to kill Dandelions because I have to wait until July. By July the whole lawn will be burnt up.

MR. PUVOGEL: It's Debbie Sangiovonni, 16 Florence Court. This happens to be the second EPA fund that's affected my life. This happens to be the second EPA fund that has affected my life. My husband was a maintenance foreman on the South Plainfield Industrial Park. So since that had been such a big EPA problem, and was also put on the Superfund list.

MS. SEPPI: Yes.

MS. SANGIOVONNI: Maybe to give some of these residents piece of mind, I know my husband had gotten blood sampling to see if he had any cancer-causing agents.

MS. SEPPI: Those are PCBs.

MS. SANGIOVONNI: Possibly some of these residents would like to do that and give them a little piece of mind. One thing I want to do that once you go in and clear all of the soil and everything, is there going to be any recording done on the deed that we do have clean deeds? I mean is anything going to be done, any recording on the deeds?

MR. PRINCE: When the work is completed?

MR. SANGIOVONNI: Yes.

MR. PRINCE: The intent of the clean up work on properties where we're doing a demolition and an entire clean up or on a property where we're only having to work around the house, the intent is to clean up to a residential living standard. So a degree to where EPA which is very conservative in its assumptions of risk, where EPA says that unrestricted use by the homeowner of that lot.

MS. SANGIOVONNI: But that doesn't tell me you have cleaned it.

MR. PRINCE: And we will write you documentation to that effect. They'll be done that level of clean up.

MS. SANGIOVONNI: Do you think

there's going to be any future liability for the homeowner if they do come in and they clean up and if they sell their house in ten years, is there going to be any liability to the homeowner?

MR. PRINCE: In a similar experiences at other properties where residential properties have been cleaned up, EPA has stayed involved with the communities and with the residents so that when they're interested in selling, if they can't find the documentation that said we're finished, we've done everything, we don't need to come back, that, you know, we'll have -- we'll keep that so that either when you want to sell your house in five years or in ten years, you'll be able to provide the respective purchasers of your house, the people come to look at it, an answer that says oh, this is not a problem.

MS. SANGIOVONNI: This is being funded by the government?

MR. PRINCE: State and federal government.

MS. SANGIOVONNI: What if the government comes in everything that comes in outside of Manville and says they pull the finding, where does that leave all of us? Can the funding be pulled from our Site? Can the government come in and say, “We are pulling it because of what's going on on Yugoslavia" or we go to war or whatever else is going on?

MR. PRINCE: The EPA is part of the federal government. Obviously, we go to Congress every year with funding requests, that state we have this much clean up work to do on this site, this site, this site, this site. This is what we're going to do and Congress does have the power of the purse. That is their role and we need to make a presentation. Since I don't know if you remember the budget showdown in '95 between the administration and Congress, there was a time during that period when funding for clean up work was not available. Since then there has not been any problems where EPA has not been able to move ahead because of lack of funding, since ‘95.

MS. SANGIOVONNI: But that could be a possibility that we could get into a year and half work, then all of a sudden, it's going to stop?

MR. PRINCE: It's part of the regular budget process.

MS. SANGIOVONNI: Okay. Thank you.

MR. PUVOGEL: Any other questions or comments?

MS. MANDERSKI: Which lagoon will you clean up first, A or B?

MR. PUVOGEL: That we don't know yet. Once we start design, we'll involve the community in those decisions and how we're going to approach it.

MR. NOVICKY: Nick Novicky, 29 Valerie. I know I'm in the middle of more or less what's going to go on. One question I think would be perhaps up to all the residents to think about, you said that crew would work like nine to five or whatever weekdays. I mean if this is a priority, I think wouldn't seven dates a week be necessary to get this stuff cleaned up?

MR. PUVOGEL: Yeah.

MR. NOVICKY: I know it's overtime. I'm saying the residents would perhaps to take a vote on, do they want their weekends disrupted? We're going to be disrupted anyway from what I see. Where I am the homes to the right of me and then behind me, I imagine Valerie would be a pretty messy street, too.

MR. PUVOGEL: That's one of the items --

MR. NOVICKY: Who's going to make the decision to how long these crews work or, you know, what hours. When they have to fix the road, they're 24 hours. I mean they have to get something done real quick and this is a serious situation. It's not something, you know what I mean, you are going to piddle around with and work Monday through Friday and the weekends is whatever.

MR. PUVOGEL: Right. That's

the balance that we need to strike, how much inconvenience or burden to the homeowners, and faster clean up versus a longer clean up is less intrusive, that's a balance we'll strike as we go through design and include the community in this process.

MR. NOVICKY: Okay. Thank you.

MS. SEPPI: I think you're a great candidate for our advisory group.

MR. NOVICKY: I'm not retired.

MS. SEPPI: Then you have more time. That's perfect.

AUDIENCE MEMBER: He's not retired.

MR. PUVOGEL: Does anybody else have any questions or comments? Then the other part of this public comment period includes written comments and the proposed plan that you folks have. My name and address is at the back of that proposed plan. You could send your written comments to me. They'll be responded to and this Record of Decision we've been talking about will be written up about a month and a half documents our decision process and their input into that process. Thanks for coming out tonight and if you have any questions, see us.

(Whereupon, the hearing is concluded at 8:55 p.m.)

C E R T I F I C A T E

I, DARLENE M. LEITHAUSER, a Certified Shorthand Reporter and Notary Public of the State of New Jersey, certify that the foregoing is a true and accurate transcript of the stenographic notes of the hearing on the date and place hereinbefore set forth.

I FURTHER CERTIFY that I am neither attorney nor counsel for, nor related to or employed by, any of the parties to the action in which this hearing was taken, and further that I am not a relative or employee of any attorney or counsel employed in this action, nor am I financially interested in this case.

Darlene M. Leithauser

DARLENE M. LEITHAUSER, C.S.R.
LICENSE NO. XI01002

APPENDIX D

WRITTEN COMMENTS

BOROUGH OF MANVILLE

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FAX: 908-231-8620

Mr. Richard Caspe
Director, Emergency and Remedial Response Division
United States Environmental Protection Agency - Region II
290 Broadway
New York NY 10007-1866

RE: Federal Creosoting NPL Site, Manville, New Jersey

Dear Mr. Caspe:

This correspondence is regarding the Federal Creosoting Site located in Manville, New Jersey. On Tuesday, February 10, 1999, at the Borough's municipal building, representatives of the USEPA and the Agency for Toxic Substance and Disease Registry ("ATSDR") presented information on the status of the site activities to the Claremont Community Advisory Group and Borough representatives. At the meeting, questions were raised to USEPA representatives Dr. James Hackler and new Project Manager Richard Pavogel regarding the timing of future cleanup activities in the Claremont development. Specifically, we were told that cleanup activities would start at the canal and lagoon areas in two years. As I verbalized at the meeting, this timing is not acceptable to me or the citizens of the Claremont development

Dr. Hackler explained at the meeting that the startup of cleanup activities would take at least two years to initiate due to i) the need for careful planning to minimize disruptions to the rest of the neighborhood resulting from odors, dust; and noise from excavating the canals and lagoons, ii) the need for the cleanup design to tie into and be consistent with the remediation of the rest of the site; and iii) the problems posed by active freight rail lines directly adjacent to the lagoons.

After the meeting, Dr. Hackler noted that an additional mason for the delay in performing cleanup activities at the site was the allocation and availability of financial resources. According to USEPA representatives, future site remediation will be addressed as a "Remedial" activity rather than as a "Removal" activity. As I understand it, this means that further site work must await prioritization among other sites. It is also my understanding that Federal regulations prohibit the USEPA from terminating a Removal action if there are imminent risks posed by the site to drinking water or other receptors. Based on the USEPA's own data, I believe the site remains an imminent risk to drinking water and groundwater, and therefore the USEPA should continue remediation of the site under the Removal program and initiate immediate cleanup actions at the lagoon and canal areas. My rationale is presented below.

1. The Removal Action Is Not Yet Complete.

According to the Comprehensive Environmental Response, Compensation and Liability act ("CERCLA," 40 CFR 300.410), a removal site evaluation "shall be terminated when the OSC or lead agency determines (1) there is no release; (2) the source is neither a vessel nor a facility as defined in §300.5 [State-lead remediation]; (3) *the release involves neither a hazardous substance, nor a pollutant or contaminant that may present an imminent and substancial danger to public health or welfare.*" The USEPA uses eight factors to determine the appropriateness of a removal action and whether or not there is a "threat to public health or welfare or the environment" (40 CFR 300.415(a)(2)):

(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants

The ATSDR opined at our February 10, 1999 meeting that there is no "health risk" by the levels of contaminants found in surficial soils (0"-6" interval only) at portions of the Claremont development. However, considerable creosote contamination and sludges were found in the lagoon and canal areas during the initial site investigation activities. Further information on subsurface soils and the actual extent of contamination from the lagoons and canals is only now being collected, and will not be ready for dissemination for many months. Because exposure to human, animals, and the food chain may occur through routes from subsurface as well as surficial soils, the concerns posed by the lagoons and canals remain unknown and unquantified. Therefore, this first criterion cannot be negated at this time.

(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems

The USEPA conducted pumping tests and collected samples from Manville's drinking water wells, which are located just north of the site, to assess the possibility of a "connection" between the wellfield and the former creosote site. While the results of the pumping tests are still under review, USEPA's representatives found that Manville's wellfield may be in direct hydraulic connetion with the lagoons and the canals at the Federal Creosoting site.

Manville's bedrock wells are "open hole" and intercept the same aquifer system that was previously shown to be contaminated by the former creosote site. One of the active wells (C-2A) contained bis(2-ethylexyl)phthalate at 0.190 mg/l, above the State of New Jersey's Class IIA Groundwater Quality Standard of 0.030 mg/l. There is no drinking water standard for this substance, although the USEPA Region III [1] gives 0.0048 mg/l as a

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[1]USEPA Region III Risk-based Concentration: R.L. Smith, (1/31/95).

maximum risk-based value for tap water. The source of the substance a potentially carcinogenic industrial solvent, is currently unknown, and the possibility of a connection to the former creosote site ran not be ruled out.

Manville's inactive test well T-1 was also sampled by the USEPA during the pumping test. Benzene, ethylbenzene, and naphthalene were detected at 0.0007, 0.0008, and 0.0023 mg/l respectively, below the Federal and State Maximum Contaminant Levels ("MCLs") for drinking water of 0.001, 0.7 and 0.03 mg/l, respectively. Other semivolatile organic compounds were also detected, including acenaphthene (0.017 mg/l), fluorene (0.0054 mg/l), and carbazole (0.011 mg/l). Various tentatively identified compounds ("TICs") were also found in T-1, including benzothiophene and a benzothiophene isomer. The semivolatile compounds listed above do not have any Federal or State drinking water standards. While these compounds were detected only at very low levels, they are associated with coal tar, from which creosote is derived. These compounds could be associated with the Federal Creosoting site, but it is not possible to be more certain based on this data alone.

It should be noted that it is not typical for semivolatile organic compounds to travel large distances to a production well unless the aquifer is fractured and there is a nearby source of a coal tar derivative, such as creosote. Both conditions are applicable to the Claremont development. Free product creosote is documented to remain in the lagoons and canals, and is a reasonable candidate to be the source of contamination on to T-1. and possibly C-2A.

Because one of Manville's active potable supply wells and one inactive supply well contain contaminants that may be associated with the Federal Creosoting site, the USEPA's criterion regarding contamination of drinking water supplies cannot be negated.

(iii) Hazardous substances pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release

The canals and lagoons contain free product creosote. The intent of the "drum, barrel, tank or other bulk storage container" criterion is to emphasize that containerized liquids may be an ongoing contaminant source. Free product creosote, in underground lagoons, not only poses a threat of further release, but is a release which deserves at least as much, if not more, attention than a containerized source would receive.

(iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate

High levels of creosote (a hazardous substance, pollutant, and contaminant) have been found in soils new the surface and below the groundwater table. Creosote remains in free product form, and the various contaminant components have both migrated and show the continued potential to migrate. Therefore, this criterion is easily satisfied.

(v) ***Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released***

Precipitation recharges the groundwater table in the lagoon and canal areas, and represents a continuing and ongoing threat to mobilize hazardous substances and pollutants and allow continued migration. Creosote has already been found by the USEPA's contractor in the bedrock over 100 feet below the ground surface. This criterion is also satisfied.

(vi) ***Threat of fire or explosion***

The USEPA has identified no threat of a fire or explosion at this site.

(vii) ***The availability of other appropriate federal or state response mechanisms to respond to the release***

If other Federal or State response mechanisms were available to respond to the Federal Creosoting lagoons and canals, the site would not now be on the NPL, nor be considered for further actions by the USEPA. This criterion is satisfied.

(viii) ***Other situations or facters that may pose threats to public health or welfare or the environment***

The USEPA and/or ATSDR. have opined that neither air nor surficial soil are currently a threat to public health or welfare. However, the site remains uncontrolled, and this factor alone satisfies this criterion.

In conclusion, for the USEPA to terminate a Removal site evaluation, there must no longer be an imminent and substantial danger to public health or welfare. Seven of the eight criteria used by the USEPA to verify such danger, listed as item (i) through (viii) above, are satisfied, thus:

- the USEPA's Removal action for the Federal Creosoting Site is not complete and may not be terminated pursuant to Federal regulations; and

- cleanup of the lagoon and canal am should be performed under the Removal program.

2. **The Removal Action May Be Continued**

Federal regulations (40 CFR 300.415(b)(5)) require that Removal actions be terminated (i) after $2 million has been obligated for the action or 12 months have elapsed from the date that removal activities begin on-site, unless the lead agency determines that there is an immediate risk to public health or welfare or the environment; continued response actions are immediately required to prevent, limit, or mitigate an emergency; and such assistance will not otherwise be provided on a timely basis; or (ii) continued response action is otherwise appropriate and consistent with the remedial action to be taken. These criteria are discussed below.

(i) ***There is an immediate risk to public health or welfare or the environment; continued response actions are immediately required to prevent, limit, or mitigate an emergency; and such assistance will not otherwise be provided on a timely basis***.
As demonstrated under item 1 above, the site poses an immediate risk to the public health or welfare or the environment. Should the ongoing migration of contaminants from the lagoon and canal areas continue without limitation or mitigation, these areas will remain a threat to the Borough's wellfield and to groundwaters of the State. The Borough of Manville would certainly argue that contamination of its water supplies constitutes an emergency. Without the immediate allocation of resources by USEPA, such assistance is available from others on a timely basis.

(ii) ***Continued response action is other wise appropriate and consistent with the remedial action to be taken***
Continued response actions are entirely appropriate as discussed above. It would be up to the USEPA to ensure that the most appropriate removal action is taken regarding the canals and lagoons, and this action would need to be made consistent with the remedial actions which will be taken regarding the rest of the site.

In conclusion, Federal regulations allow the Removal action to be continued to address the lagoons and canals in a timely manner.

3. **The Removal Program is Designed For the Site Conditions at the Federal Creosoting Site**
Federal regulations (40 CFR 300.415(d)) include removal actions that are, "as a general rule, appropriate...however, the list is not exhaustive and is not intended to prevent the lead agency from taking any other actions deemed necessary under CERCLA or other appropriate federal or state enforcement or response authorities..." Among these listed actions are the following, which are directly applicable to the current Federal Creosoting site conditions:

- Stabilization of berms, dikes, or impoundments or drainage or closing of lagoons-where needed to maintain the integrity of the structures (§300.415(d)3);

- Capping of contaminated soils or sludges-where needed to reduce migration of hazardous substances or pollutants or contaminants into soil, ground or surface water, or air (§300.415(d)4);

- Excavation, consolidation, or removal of highly contaminated soils from drainage or other areas-where such actions will reduce the spread of, or direct contact with, the contamination (§300.415(d)6);

- Removal of drums, barrels, tanks, or other bulk containers that contain or may contain hazardous substances or pollutants or contaminants-where it will reduce the likelihood of spillage; leakage; exposure to humans, animals, or food chain; or fire or explosion (§300.415(d)7); and

- Containment, treatment, disposal, or incineration of hazardous materials-where needed to reduce the likelihood of human, animal or food chain exposure (§300.415(d)8).

All of the above categories, especially item §300.415(d)6, the excavation of contaminated materials from drainage areas, apply directly to the canals and lagoons at the Federal Creosoting Site.

Conclusion
The results of the site investigation performed to date and the USEPA pumping tests at the Manville Borough wells indicate a clear and compelling reason for USEPA to quickly proceed with the cleanup of the lagoon and canal areas, preferably to complete off-site removal. We believe that the USEPA has the jurisdiction, authority, and ability under CERCLA to either i) perform the lagoon and canal area cleanup as a Removal Action; or ii) immediately allocate funds under either the Removal or Remedial programs to start cleanup of the lagoon and canal areas.

I am always available to discuss these matters further. I look forward to hearing from you.

Very truly yours,

Angelo Corradino, Mayor

cc: Hon. Robert Franks

May 13, 1999

U.S. Environmental Protection Agency
Mr. Rich Puvogel
290 Broadway, 19th Floor
New York, NY 10007-1866

Dear Rich,

This letter is in response to the **Superfund Proposed Plan** for the Federal Creosote Site in Manville, NJ. As homeowners on the buyout list, I would like to have the **Right of First Refusal**.

I propose that after the clean-up is completed, my property should be offered to me first for purchase. I did not intend to move, yet it was necessary. My property is where I had intended to continue living. Therefore, I would like to have the first option to purchase my property without bidding against developers. I would like pay a fair price, below market value. The Borough of Manville will still gain income, and I will not have additional hardship. After all, I will be living in a different location, with all new expenses. This has been a drastic imposition of my family and I would like to see that my proposal is considered. It shows good community conscience and compassion.

Sincerely,

WŁADYSŁAW + ZOFIA KAFARA
216 E. CAMPLAIN Rd
MANVILLE. N.J. 08835

Robert & Mary Strain

271 East Complain Road
Manville, New Jersey 08835
(908) 725-7044

June 23, 1999

Rich Puvogel
Remedial Project Manager
US Environmental Protection Agency
290 Broadway - 19th Floor
New York, NY 10007

RE: **Proposed Cleanup Federal Creosote Superfund Site**
Town of Manville, Somerset County, New Jersey

Dear Mr. Puvogel:

We are writing to express our concerns regarding the proposed plan referring to the above. In light of the alternatives suggestions, we have the following concerns:

- The safety of ourselves, neighbors, family, and friends.
- According to the plan, it will take years before the site is absolved of the creosote, cleanup, construction, etc.
- Our level of confidence is not high regarding the safety of living in the development while construction is being done (equipment, flow of traffic, security, etc.).
- The order of creosote will be unbearable.
- Construction will be easier for all parties concerned if all homes were bought. All the homes should be demolished, the area cleaned up, and the borough can do what they want with the land (new homes, stores, parks, etc.). In the long run, this will also save time and money.
- We are forced to live in a development/home which we do not feel secure. We cannot sell our homes for fair market value.
- Since the problem of creosote arose a few years ago, we still cannot get a clear answer to any question (health risks, timeframe for cleanup, extent of damage, cleanup plan, etc.).

In closing, we believe the best recommendation for the quality of lives of all concerned, all homes should be bought out given the residents a chance to relocate and live in a safe environment.

Sincerely,

Robert W. Strain, III
Mary A. Strain

May 13, 1999

U.S. Environmental Protection Agency
Mr. Rich Puvogel
290 Broadway, 19th Floor
New York NY 10007-1866

Dear Rich,

This letter is in response to the **Superfund Proposed Plan** for the Federal Creosote Site in Manville, NJ. As a homeowner on the potential buyout list, I would like to have the **Right of First Refusal.**

In the event of a buyout, I propose that after the clean-up is completed, my property should be offered to me first for purchase. My property is where I had intended to continue living without any health risks. Therefore, I would like to have the first option to purchase my property without bidding against developers. I would like pay a fair price, below market value. The Borough of Manville will still gain income, and I will not have additional hardship. After all, I will be living in a different location, with all new expenses. This has been a drastic imposition on my family and I would like to see that my proposal is considered. It shows good community conscience and compassion.

Second, I would like to be on record in favor of a buyout of my property. I do not look forward to the inconvenience of busing my children to school from a temporary location. I would not like to move twice. This would put my life on "hold" even longer. I also fear for the health safety of my family if we will continue living in this community during any phase of clean-up and just following clean-up. The superfund process has taken a mental toll on my family, including my children. Please let it end.

Sincerely,

Ann McGinnis
127 E. Camplain Rd.
Manville, NJ 08835
(908) 725-2644

Comments on the April 1999 Superfund Proposed Plan Federal Creosote Site Manville, New Jersey

1 June 1999

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11. Landfarming bioremediation is viable solution at Lake Erie MGP, Brian P. Herner, Steven M. Goldberg, and Owen P. Ward, “Soil and Groundwater Cleanup”, June 1998.

12. BetzDearborn Bioremediation Technologies, Daramend™, Remedial Technologies Network, Copyright 1999.

13. SteamTech, Inc. and Integrated Water Technologies, Inc., In Situ Hydrous Pyrolysis/Oxidation (HPO), Remedial Technologies Network, Copyright 1999.

14. In Situ Hydrothermal Oxidative Destruction of DNAPLS in a Creosote Contaminated Site. Roald N. Leif, Marina Chiarappa, Roger D, Aines, Robin L. Newmark, Kevin G. Knauss, and Craig Eaker, Visalia, California, Edison Pole Yard Site.

15. Cleaning Soil with Steam Injection,, “Environmental Technology”, September/October 1997.

16. Western Research Institute, Contained Recovery of Oily Wastes (CROW™), Remedial Technologies Network, Copyright 1999.

17. In Situ Thermal Desorption, “Environmental Protection”, Jude R. Rolfes, February 1998.

18. Destroying PCBs in Soil at a Dragstrip-In Situ, “Environmental Technology”, Mike Attaway, September/October 1997.

19. BioTrol Soil Washing System for Treatment of a Wood Preserving Site-Applications Analysis Report, US Environmental Protection Agency, Office of Research and Development, EPA/540/A5-91/003, February 1992.

20. Phytoremediation can be Designed for MGP Site Contaminants, George E. Boyajian and Richard B. Sumner, “Soil and Groundwater Cleanup”, June 1998.

21. Carbon Consultants, HCZyme, Remedial Technologies Network, Copyright 1999.

22. National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, section 300.5 (Definitions), March 8, 1990 (revised September 14, 1994).

23. National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, section 300.5 (Definitions), March 8, 1990.

24. Memorandum on the Formation of National Superfund Remedy Review Board, from Assistant Administrator Elliott P. Laws to Regional Waste Management Division Directors, November 28,1995.

25. Memorandum on the Review of Non-Time-Critical Removal Actions by the National Remedy Review Board, from Stephen D. Luftig, Director of OEER to Regional Waste Management Division Directors, December 18,1997.

26. Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites, US Environmental Protection Agency, Office of Solid Waste and Emergency Response, Directive 9200.5-5-162, EPA/540/R-95/128, (page 2) December 1995.

27. Presumptive Remedies: Policy and Procedures, US Environmental Protection Agency, Office of Solid Waste and Emergency Response, Directive 9360.0-46FS, EPA 540-F-93-047, September 1993.

28. Presumptive Remedies: Technology Selection Guide for Wood Treater Sites, US Environmental Protection Agency, Office of Solid Waste and Emergency Response, Publication 9360.0-46FS, EPA 540-F-93-020, April 1993.

29. The Role of Cost in the Superfund Remedy Selection Process, US Environmental Protection Agency, Office of Solid Waste and Emergency Response, Publication 9200.3-23FS, EPA 540/F-96/018, (page 6) September 1996.

30. Federal Register, Volume 55 No. 46, page 8750, March 8,1990.

31. Engineering Issue: Data Gaps in Remedial Design, Moylan, JE, US Envirorunental Protection agency, US Army Corps of Engineers, July 1991.

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June 1, 1999

Mr. Rich Puvogel
Project Manager
U.S. Environmental Protection Agency
19th Floor
290 Broadway
New York, New York 10007-1866

Re: **Federal Creosote Site, Manville, N.J.**

Dear Mr. Puvogel:

In April EPA released the Proposed Plan for the Federal Creosote Site, and advised that the comment period runs until June 1, 1999. Our client has reviewed the Proposed Plan and believes that it is seriously flawed. Accordingly, I am submitting the enclosed comments on the Proposed Plan.

We have concerns about the administrative record that has been made available. The Proposed Plan states that the Administrative Record is available at the Manville Public Library and the EPA-Superfund Records Center in New York. When we contacted the EPA Superfund Records Center, however, we were advised that the Administrative Record was not available. We did review the materials available in the Manville Public Library. As discussed in the attached comments, we did not find backup data and information typically provided by EPA. We thus request that this information be provided, and reserve the opportunity to supplement these comments after reviewing this information.

Sincerely yours,

Theodore L. Garrett

Enclosure

COMMENTS ON THE SUPERFUND PROPOSED PLAN FEDERAL CREOSOTE SITE MANVILLE, NEW JERSEY

This document summarizes comments on the Proposed Plan for the Federal Creosote Site ("Site") in Manville, New Jersey. The Proposed Plan, dated April 1999, was issued by the US Environmental Protection Agency ("EPA") and identified a preferred remedial alternative for the source areas of the Site. EPA maintains that the preferred remedial alternative will be protective of human health and the environment, comply with Applicable, or Relevant and Appropriate Requirements ("ARARs") and will reduce the toxicity, mobility and volume of contaminants to the maximum extent practicable. EPA further maintains that the preferred remedial alternative will also meet the statutory preference for using a remedy that involves treatment as a principal element. The preferred remedial alternative identified in the Proposed Plan is estimated to cost $58,000,000.

The comments in this document raise serious questions regarding: 1) the process by which EPA came to select the preferred alternative, 2) how the risk characterization skewed the magnitude of the response and failed to proportionately consider the risks associated with implementation of the preferred remedial alternative, 3) uncertainties in the engineering evaluation that will undoubtedly result in the cost for the preferred remedial alternative exceeding the $58,000,000; 4) the biased selection of excavation and off-site treatment/ disposal as general response actions in developing the remedial alternatives that were considered; and, 5) the elimination of other remedial alternatives that could accomplish the same objectives at a significantly lower cost.

Superfund Process Comments

1. ***The scope of the EPA's preferred alternative is not compatible with the definition of Operable Unit provided in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP)***

The Proposed Plan indicates that the cleanup strategy for the Site is the first phase, or Operable Unit and is considered to be an early action that only addresses cleanup of the highly contaminated source areas. The NCP defines operable unit as a discrete action that comprises an incremental step toward comprehensively addressing site problems.[1]

The highly contaminated soils and sludges identified in canals A and B and lagoons A and B can reasonably be identified as source materials whose location satisfies the NCP definition of an operable unit. However, the $58,000,000 estimate for the EPA's preferred alternative is not consistent with an action that is supposed to be a "discrete portion of the remedial response. For example, the average Superfund cleanup construction project cost is now $10,000,000. [4] The current average reflects a decrease of $1.2 to $1.6 million per project over the last two years. Moreover, the Superfund Program was able to affect these savings while maintaining protective cleanups that continue to achieve the mandate for "permanence" and treatment of waste. The Site is neither so complex, nor the exposure to hazardous substances so acute, as to warrant an expenditure of almost 6 times the current average.

If the EPA preferred remedy is not an operable unit, the EE/CA suggests it is a removal action. However, the estimated cost and duration of the EPA preferred remedy would also not justify it as a removal action under the NCP.

In light of the above, EPA should have gathered more information regarding the nature and extent of contamination, developed remedial alternatives that encompassed all the presumptive remedy options, and performed a more comparative analysis typical of a feasibility study. As explained later in this comment document, there exist other options, not considered by EPA, to accomplish the objectives set forth in the proposed plan for this operable unit for considerably less cost.

2. ***In opting for the permanent relocation of ten to nineteen residents, there was an obligation under the NCP to seek a cost-effective remedial action once the affected areas were vacated.***

The NCP provides for remedial action costs associated with the permanent relocation of residents. In doing so, it is presumed that relocation (either alone or in combination with other measures) is more "cost-effective" than, and environmentally preferable to, the secure disposition off-site of such hazardous substances that may otherwise be necessary for the protection of the public health or welfare. [2]

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1 National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, section 300.5 (Definitions), March 8, 1990 (revised September 14, 1994)

2 National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, section 300.5 (Definitions), March 8, 1990

Relocation of residents in this plan appears to be for practical purposes, i.e., to facilitate the excavation of the buried wastes as ATSDR has determined that there are no short-term exposure risks. However, if residents are relocated to facilitate clean up, longer-term risks must also be reduced. This reduction in potential risks would suggest that the limitations to on-site in situ or ex situ remedial options, which were eliminated from consideration in the proposed plan would have been removed. Hence, on-site actions should be reasonably considered in conjunction with relocation. The plan should therefore evaluate both ex situ and in situ on-site alternatives, because they would considerably reduce the remedial costs.

3. ***The $58,000,000 preferred alternative identified in the Proposed Plan by EPA warrants a review by the National Remedy Review Board (NRRB).***

The NRRB was created in January 1996 as part of a comprehensive package of reforms to the Superfund program. The NRRB "...is intended to help control remedy costs and to promote consistent and cost-effective decisions at Superfund sites, ..." [3].

The NRRB is tasked with reviewing all proposed cleanup decisions where: 1) the proposed action costs more than $30,000,000; or 2) the proposed action costs more than $10,000,000 and this cost is 50% greater than that of the least-costly, protective alternative that also complies with other laws or regulations that are "applicable" or "relevant and appropriate" to a site decision or action. The EPA's preferred alternative in the Proposed Plan meets these criteria.

The EPA administrative memorandum announcing the formation of the NRRB anticipated that the board would conduct its review and make its recommendations on a preferred remedy before a proposed plan is issued for public comment. Moreover, the involvement of the NRRB was extended to the review of non-time critical removal actions, applying the same criteria and emphasizing that the review occur before the Engineering Evaluation/Cost Analysis (EE/CA) is issued for public comment4

There is no mention in the Proposed Plan that an NRRB review took place, or if it did, what the recommendations of the NRRB were.

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[3] Memorandum on the Formation of National Superfund Remedy Review Board, from Assistant Administrator Elliott P. Laws to Regional Waste Management Division Directors, November 28,1995.

[4] Memorandum on the Review of Non-Time-Critical Removal Actions by the National remedy Review Board, from Stephen D. Luftig, Director of OEER to Regional Waste Management Division Directors, December 18,1997.

4. ***By conducting the Engineering Evaluation/Cost Analysis (EE/CA), EPA acknowledged that they could not take advantage of the generic justification provided by the "Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites."***

EPA has identified presumptive remedies for wood treater sites, which the agency believes represent appropriate response action alternatives. The actions identified in the presumptive remedy document are expected to be used except under unusual site-specific circumstances. Presumptive remedies are expected to save time and reduce costs and therefore, generally should be used. EPA also acknowledged that it might also be possible to accelerate remedy selection for non-presumptive technologies by performing a conventional Remedial Investigation and Feasibility Study (RI/FS) or EE/CA. [5]

EPA adopted presumptive remedial approaches to streamline and accelerate the remedy selection process. However, at the Site, the EPA still found it necessary to carry out an EE/CA to justify its remedy selection. Although the EE/CA did streamline the remedy selection process, the $58,000,000 cost for the remedy can hardly be viewed as a minimized cost. This is due largely to the fact that excluding the no action alternative, of the five remedial alternatives considered in the EE/CA; four were predicated on general response actions involving excavation and off-site disposal and treatment. Hence, the largest engineering cost component (excavation and off-site treatment and disposal), that represents in excess of 50% of the estimated remedial cost was common to the majority of alternatives. As a result the EE/CA was skewed in its evaluation. The EE/CA did not consider alternatives that employed bioremediation and/or thermal treatment, two additional technologies identified in the wood treater presumptive remedy document.

5. ***The EE/CA was biased in its identification of remedial alternatives, even in identifying those that are consistent with presumptive remedies for wood treater sites.***

The EE/CA considered only certain alternatives relating to bioremediation, thermal desorption and incineration technologies, the identified presumptive remedies for wood treater sites. However, in deciding to conduct the EE/CA, EPA should have considered on-site ex situ or in situ bioremedial and/or thermal options that would achieve the stated objectives, particularly as such options become practical with resident relocation. Moreover, in situ options are

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[5] Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites, US Environmental Protection Agency, Office of Solid Waste and Emergency Response, Directive 9200.5-5-162, EPA/540/R-95/128, (page 2) December 1995

less likely to result in the magnitude of potential exposures to the community during excavation as compared to the EPA's preferred alternative.

On-site options, which are consistent with the presumptive remedies for wood treater sites, would be viable once residents are relocated. As such, they are consistent with EPA's presumptive remedy guidance. Moreover, the presumptive remedy guidance recognizes that, among other things, there may be significant advantages of innovative technologies over the presumptive remedies that warrant their consideration. [6] To the extent in situ application of one or more of the presumptive remedies would be considered innovative, the NCP expects EPA to consider an appropriate innovative technology. [7] As indicated in EPA's Presumptive Remedy Policy and Procedures, presumptive remedies do not preclude the consideration of innovative technologies should the technologies be demonstrated to be as effective or superior to the presumptive remedies. [8]

The additional remedial alternatives described later in this comment document are viable substitutes to consider to meet the objectives as set forth in the Proposed Plan. These additional remedial alternatives are either consistent with the presumptive remedy guidance or are innovative approaches for which performance data shows their applicability to the subject waste profile. EPA should have evaluated these alternatives in light of the agency's acknowledgment that there are practical considerations associated with the expense of shipping quantities of contaminated soil in excess of 5,000 cubic yards off-site for disposal. [9]

6. ***The only complete discussion of the balancing criteria, other than cost, appears for the first time in the Proposed Plan. Since the Proposed Plan only presented two remedial alternatives, one being No Action, other remedial alternatives, including those that should have been considered (see above), did not benefit from this more detailed evaluation.***

As previously mentioned, the five remedial alternatives identified in the EE/CA (excluding No Action) were biased to those based on excavation and off-site treatment and disposal. These alternatives were screened for effectiveness, implementability and cost Presumably, the initial EE/CA served as the basis for

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6 Ibid. (page 4).

7 National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, section 300.430 (a) (1) (iii) (E), March 8, 1990 (revised September 14, 1994)

8 Presumptive Remedies: Policy and Procedures, US Environmental Protection Agency, Office of Solid Waste and Emergency Response, Directive 9355.0-47FS, EPA 540-F-93-047, September 1993

9 Presumptive Remedies: Technology Selection Guide for Wood Treater Sites, US Environmental Protection Agency, Office of Solid Waste and Emergency Response, Publication 9360.0-46FS, EPA 540-F-93-020, April 1993.

the focused EE/CA because all four alternatives contained in the focused EE/CA required excavation and off-site treatment and disposal. The alternatives in the focused EE/CA were based on remedial strategies from the original EE/ CA, with modifications incorporating different elements of the original alternatives to create four separate new alternatives. The focused EE/CA only evaluated the costs associated with these four limited alternatives. As stated above, bioremedial and thermal desorptive approaches were not evaluated.

The process of selecting a remedy is the decision making bridge between development of remedial alternatives and documentation of a selected remedy. The process begins with the identification of a preferred remedial alternative in a Proposed Plan. The identification process relies on the evaluation of previously developed remedial alternatives.

The EPA's preferred remedial alternative was not compared to remedial alternatives that employed the other presumptive wood treater remedies, or remedial alternatives developed, using all of the balancing criteria i.e., long-term effectiveness and permanence, reduction in toxicity, mobility and volume and short-term effectiveness in addition to effectiveness, implementability and cost. These criteria, along with the other threshold criteria were only discussed in the Proposed Plan when the basis of comparison was only No Action. Therefore, the EPA's preferred remedial alternative was not afforded a fun comparative analysis, which focuses on the relative performance of each considered alternative, as contemplated in the NCP.[10]

7. ***The EE/CA should have considered waiving certain ARARs in light of the costs for the considered remedial alternatives.***

The Proposed Plan states that the material in the source areas is a fisted RCRA waste. Off-site treatment and disposal would therefore need to be performed at a RCRA-permitted facility. This EE/CA identified this issue as an ARAR, effectively eliminating any other off-site thermal treatment except incineration, as an option because no such RCRA permitted facility was identified. Consequently, the EPAs preferred remedial alternative adopts off-site thermal treatment in an incinerator.

Once again, the cost associated with the EPA's preferred remedial alternative ($58,000,000) should have triggered a more in-depth review of treatment options. Aside from the previously mentioned alternatives, which are consistent with presumptive remedy guidance and more cost effective, the limited alternatives

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10 National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, section 300.430 (e) (2) (iii), (ii), (9), (ii) March 8, 1990 (revised September 14, 1994)

considered in the EE/CA could benefit from consideration of waiving this ARAR.

According to the NCPI a remedy must satisfy the two threshold criteria, protection of human health and the environment and compliance with ARARs (unless a specific ARAR is waived).[11] Although cost is not a factor in identification of ARARs, CERCLA authorizes the waiver of an ARAR with respect to a remedial alternative if any one of six bases exist.[12] Specifically, cost may be a consideration when determining whether a waiver is justified for "technical impracticability", "equivalent level of performance", or "Fund-balancing".

A waiver for the ARAR associated with the EPA's preferred remedial alternative that prevents off-site treatment at a non-RCRA permitted facility should have been evaluated based on "equivalent level of performance" or "Fund balancing".

In the case of "equivalent level of performance", the EE/CA acknowledges that thermal desorption can meet an equivalent level of performance as incineration. A similar conclusion was set forth in the guidance for presumptive remedies for wood treater sites. The only impediment to off-site thermal desorption is due to the listed nature of the material and the unavailability of off-site RCRA permitted thermal desorption units.

While cost is not considered in evaluating equivalence, this waiver could provide cost-saving flexibility. Because the estimated cost for treatment and disposal is more than 50% of the total estimated preferred remedial alternative cost less expensive technologies that can achieve the same outcome should have been explored before adopting a costly approach. Rejection of a comparable technology simply because of an action-specific ARAR[13] is unjustifiable.

Since Fund monies are being expended for the preferred remedial alternative, consideration should have been given to invoking a Fund balancing waiver with respect to the need for using an off-site RCRA permitted facility for treatment. EPA's policy is to consider this waiver when the total cost of the remedy Lis greater than four times the national average cost of remediating an operable unit (currently 4x$10,000,000 or $40,000,000).[14] As the estimated cost for the preferred

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11 National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, section 300.430 (f) (i) (A), March 8, 1990 (revised September 14, 1994)

12 The Role of Cost in the Superfund Remedy Selection Process, US Environmental Protection Agency, Office of Solid Waste and Emergency Response, Publication 9200-1-23FS, EPA 540/F-96//018, September 1996 (page 6)

13 Ibid.

14 bid.

remedial alternative exceeds this threshold, a waiver may be warranted if this single Site expenditure would place a disproportionate burden on the fund.[15]

8. The administrative record was not readily available and is incomplete.

The administrative record was not available at the EPA-Superfund Records Center in New York. The administrative record at the Manville Public library is incomplete. For example, it does not include information such as the raw analytical data, the QA/QC packages and the boring logs. We reserve the right to review this data and comment further at a later date.

Risk Characterization Comments

9. The distribution of PAH congeners does not resemble other wood treating sites, and the assessment of potential risks may therefore need to be reevaluated.

Virtually every polycychc aromatic hydrocarbon (PAH) was detected at the Site, including all species of carcinogenic PAHs (cPAHs). Unusually, however, benzo(a)pyrene (BaP) is consistently present as 60% of the total cPAH risk. Normally, BaP is a minor constituent. The EPA should make sure that a QA/QC check has been done to insure that BaP (and other PAHs) are being identified correctly. Alternatively, the risk assessment performed by CDM Federal Facilities may have incorrectly assumed a log normal distribution for the contaminants. Evidence should be provided to support the use of a log normalcy assumption. Finally, CDM Federal generally substituted one-half the detection limit for non-detects. In a small censured data set, this substitution may be inappropriate and may have contributed to the unusual distribution of PAHs observed.

10. The Site at present does not present unacceptable exposure risks.

Although potential carcinogenic risk exists at depth and, at least upon two occasions, apparent creosote tars have come bubbling up to the surface, there is no fate and transport analysis as to whether further excursions of impacted materials to the surface are likely to occur. ATSDR has concluded that the Site does not present an unacceptable public health risk at present, which conclusion is at odds with EPA's preferred alternative (i.e., if current risks are acceptable, an extensive high cost remedy with significant short-term risks may not be warranted).

[15] Federal Register, Volume 55 No. 46, page 8750, March 8,1990.

11. Risks to the community will be exacerbated through execution of the preferred remedial alternative.

As noted above, despite EPA's emergency listing, there are no unacceptable public health risks at present However, the proposed excavation and hauling off-site of over 44,000 cubic yards of contaminated soil will present considerable public health risk. Increased exposures from EPA's preferred remedial alternative include: Mobilization of creosote tar components into ground water and air (both vapors and dust), and contamination of adjacent commercial and residential properties, and risks to community residents from heavy-duty vehicular traffic. Concerning the latter, it should be noted that the Claremont development has limited access at present which access would be further limited by excavation activities and increased truck traffic at entryways. In contrast to EPA's preferred remedy, various in situ remedial alternatives will minimize potential exposures to contaminants, vehicular traffic and public health risks, although these technologies may require delimited evacuation of some Claremont residents.

12. The Proposed Plan fails to indicate what the estimated potential risks were for the two apparent excursions of creosote tars to surface.

Both EPA default and revised cancer risk guidelines should be used to complete the analysis. The analysis should consider the short-term nature of the potential exposures, the actual constituent to concentrations in the material encountered, and the fact that these two excursions represent the only known potential exposures over the 50+ years that the materials have been at the Site.

13. The Site should be characterized more completely concerning potential exposure pathways.

The Site characterization as presented in the Proposed Plan appears incomplete, especially concerning physical parameters of the subsurface. A more complete description of physical properties of creosote tars and hydrogeology are required to predict future fate and transport of tar constituents, for accurate predictive risk assessment and prior to implementation of any in situ or ex situ treatment technologies.

Critical issues which must be examined and resolved prior to any fate and transport analysis, risk assessment or remedy implementation include.

- The mobility of creosote tars in the canal and lagoon areas,

- The consistency (viscosity) of these tars as compared to other viscous substances such as asphalt molasses, heavy oil or light oil;

- The melting point and high temperature water solubility of tar constituents;

- The water solubility of tar constituents under ambient conditions;

- The composition of subsurface soil with respect to granularity, carbon and day content and permeability;

- Whether creosote tars exist within both saturated and unsaturated zones; and

- Potential mobilization conduits created by sewer, optical cable and other lines which transect the site.

Resolution of these critical issues will have a direct impact on the design and construction of the preferred remedial alternative. Moreover, the potential adverse effects from such data gaps can cause schedule slippage and cost overruns during the design and construction phases of remedy implementation.[16]

14. In Situ remedial alternatives exist which will minimize future risks.

As noted above, excavation and removal actions will exacerbate public health risks. In situ technologies exist, however, which will alleviate future potential migration of creosote tars to the surface. While some of these might entail partial or temporary complete evacuation, these will prove less disruptive, safer and less costly than the proposed remedy. Ostensibly, if an in situ alternative remedy requires no excavation, no homes would need to be destroyed. If relocation is for a longer term, a viable sub-option, from a risk perspective, would be to buy all affected homes and, following remediation, sell these homes back to the community.

Proposed Remedy Comments

15. It is premature to evaluate and select a preferred remedial alternative for this site until after the investigation and delineation activities are completed.

Based on the significant uncertainties regarding the extent and volume of impacted materials to be remediated, it is premature to complete the evaluation and selection of a remedial option for the Site. As presented in the Proposed

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[16] Engineering Issue: Data Gaps in Remedial Design,Moylan JE, US Environmental Protection Agency, US Army Corps of Engineers, July 1991

Plan, the volume of impacted materials requiring remediation "may change substantially pending a review of the subsurface data". Such changes could dramatically impact the number of houses to be relocated, the number of affected residents, the total costs and risks of various alternatives, and the overall comparison of options. Because the ATSDR evaluation has indicated that there are no unacceptable short-term risks, and because the waste has been present for at least 40 years, it would be appropriate to wait until the site investigation and evaluation activities are completed prior to the final evaluation and selection of a preferred remedy.

16. ***The EPA's proposed remedy should be reconsidered because the actual remediation costs may greatly exceed the $58,000,000 estimate for the preferred alternative presented in the Proposed Plan.***

A number of factors including a potentially larger waste volume, potentially underestimated unit costs, and potentially omitted remediation activities could cause the EPA's preferred remedy to cost much more than the $58 million presented in the Proposed Plan. As a result the evaluation and comparison of remedial alternatives is a flawed basis for the selection of a preferred remedy.

As presented in the Proposed Plan, all soils "exhibiting signs of visible contamination" would be removed under the preferred remedy. Further, the Proposed Plan states that the estimated volume of impacted soils upon which the evaluation was based "may change substantially pending a review of the subsurface data". This lack of data presents a significant concern with regards to the evaluation of remedial options because even a small change in the volume of soil to be removed could have a profound impact on the overall cost of the remediation because more than 50 percent of the remedial cost is for excavation, treatment and disposal. For example, considering the difficulties likely to be encountered during the excavation, and potential over-excavation as a result of visual staining and field decisions, removal of as little as 5-feet of additional soil from each boundary of lAgoons and Canals A and B would result in a 30 percent increase in the volume of soil excavated. This would increase the overall cost by approximately $8 million. If chemical testing is used to define the limits of excavation, cost increases much greater than 30 percent could easily result. Costs could therefore easily increase to beyond $100 million. Such a potential cost increase warrants a re-evaluation of the remedial alternatives and preferred remedy.

The unit costs for off-site transportation and incineration may be underestimated, and are therefore not a reasonable basis for the evaluation and selection of a preferred remedy. For example, recent vendor quotes put the cost of incineration alone (without transportation and associated costs) are $700 to over $1,000 per ton of material, as opposed to the $510 per ton assumed in the EE/CA (see Attachment 3). Published remediation cost data also reflects a cost of over $1,000 per ton for the incineration of bulk solid wastes.[17] Based on the estimated approximately 60,000 tons of material to be incinerated, every $100 extra per ton would increase the total remediation costs by $6 million. Based on a transportation and incineration cost of $1,000, the total remediation cost could approach $30 million more than estimated in the EE/CA.

A detailed evaluation of the EE/CA also indicates that costs for items such as perimeter air monitoring for community protection and related required activities have not been adequately reflected in the estimated costs presented in the Proposed Plan.

17. The $58,000,000 preferred alternative identified by EPA in the Proposed Plan presents potentially significant implementation problems and short-term risks that have not been adequately evaluated in the Proposed Plan.

The analysis of the EPA's preferred remedy presented in the Proposed Plan underestimates the potential implementation problems and short-terms risks associated with the excavation and off-site incineration of the impacted soils, and therefore is not an appropriate basis for the selection of a remedy.

For example, the actual volume and locations of material to be excavated have not been fully defined, and "may change substantially pending a review of the subsurface data". As a result, implementation concerns associated with the total area of disturbance, volume of material to be handled, and number of affected properties and houses to be demolished have not been adequately characterized.

Further, the Proposed Plan states that the EPA's preferred alternative (excavation and off-site disposal) would eliminate the potential exposure of residents to contaminated soils, and there would be no local human health impacts. However, based on the estimated excavation mass of greater than 66,000 tons, and assuming a standard truck size of approximately 20 tons, the EPA's preferred remedy would require more than 3,300 additional trucks to and from the site. This additional traffic presents potentially significant risks to the public as a result of traffic accidents, spills, releases, etc. Also, the significant exposure and handling of impacted soils increases potential exposure risks as compared to the current conditions where the materials are generally separated from the community by the existing cover soils.

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[17] Environmental Remediation Cost Data - Unit Price, R.S. Means Company Inc, and Delta Techologies Group, Inc., 1998. Cost Item 33 19 9520, page 8-186.

Finally, the EE/CA and Proposed Plan do not adequately reflect the potential implementation concerns and short-term risks associated with the control of fugitive emissions. As a result, the EPA's preferred remedy likely presents greater short-term risks than reflected in the Proposed Plan. The EE/CA and Proposed Plan rely on the use of a pre-fabricated enclosure for the control of fugitive emissions. However, based on the location of the impacted soils to be excavated, and the structures schedule to remain in place, there is not enough room to erect an enclosure over all excavation areas, and therefore fugitive emissions are a potential concern. Also, and as discussed in related EPA technical documents[18] (see Attachment 3), short-term risks to workers working within an enclosure can be significant as a result of hazardous air concentrations within the enclosure, significant personal protective equipment (PPE) required, the potential for PPE failure, and significant physical hazards associated with the confined working conditions and poor visibility.

Alternative Remedy Comments

18. The remedy evaluation and selection process failed to adequately consider alternate in situ remedial approaches that could be more cost-effective than the preferred alternative identified in the Proposed Plan.

The EE/CA considered only one in situ treatment alternative (in situ immobilization), and eliminated it on the basis of effectiveness and technology limitations. However, a number of other in situ remedial approaches have been successfully utilized at similar sites, and would likely provide a more cost effective and lower risk remedy than the preferred remedy presented in the Proposed Plan. Based on the significantly lower costs and potentially lower risks presented by these in situ technologies, the EPA's preferred remedy in the Proposed Plan should be reconsidered.

Bioremediation is an applicable remedy identified in the EPA wood treaters presumptive remedy guidance document Both ex situ and in situ bioremedial remedies have been identified, screened and selected as the preferred remedy at wood treater sites. As presented in EPA's wood treaters presumptive remedy guidance (see Attachment 1), of the 18 RODs where bioremediation was considered, it was selected as the preferred remedy in 9 RODs (as a comparison, off-site incineration was selected at only 4 of the 26 sites where incineration was considered). Considering the residential nature of the Site, use of in situ bioremediation would maintain the integrity of the community while reducing the overall risks to the residents. Although bioremediation of the site may

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[18] Demonstration of a Trial Excavation at the McColl Superfund Site - Applications Analysis Report, US Environmental Protection Agency, Office of Research and Development, EPA/540/AR-92/015, October 1992

require a longer period to reach target levels, the ATSDR evaluation has indicated that there are no acute short-term risks, therefore a longer remedial program could effectively be implemented. EPA technology documents present a potential cost range of $50 to $250 per cubic yard for the successful biological treatment of creosote-contaminated soils and wastes[19], which would result in significantly lower remediation costs than presented by the preferred remedy (see Attachment 3).

In situ thermal desorption is another potentially cost-effective remedial measure that was not considered in the EE/CA or the Proposed Plan. This process uses thermal wells and/or thermal blankets to remove constituents in situ, where they are collected and destroyed at the surface. This remedial approach has been effective at manufactured gas plant sites and other sites with creosote-type wastes (see Attachment 3). By leaving the wastes in situ., the significant implementation concerns associated with excavation and off-site incineration (e.g., short-term exposure risks, house demolition, disruption of the entire community, increased truck traffic, fugitive emission controls, excavation below the water table, etc.) are eliminated. Further, this process can be implemented in a relatively short time period, and estimated costs for this alternative ($50 to $150 per ton, see Attachment 3) are significantly lower than the costs for off-site incineration. Related technologies that are also potentially applicable to this site include in situ thermal methods that involve steam and oxygen injection such as the hydrous pyrolysis/oxidation (HPO) process. HPO has been demonstrated to be successful at the Visalia Commercial Creosote Site in Visalia, California (see Attachment 3).

Phytoremediation, i.e., the use of plants for remediation has gained acceptance in the past 2 to 4 years and has been demonstrated effective as; alternative caps for waste site closure, ground water treatment systems and clean up agents (see Attachment 3). Plant species tolerant to wood treater wastes such as perennial rye grasses have passed greenhouse treatability studies at a wood treatment site in Portland Oregon. The site has been seeded and studies indicate that significant contaminant degradation in shallow soil should occur in two growing seasons. Mulberry and hackberry trees have been used by Union Carbide to provide a closure for a former impoundment containing highly toxic sludge with the consistency of axle grease that contained PAHs and other mixed wastes. The vegetative cover has lowered the water-table in the former impoundment, preventing contaminant leaching to ground water and excavation of the site has revealed that the upper portions (up to 40-inches) of the basin looks like top soil

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[19] Pilot-Scale Demonstration of a Slurry-Phase Biological Reactor for Creosote-Contaminated Soil - Applications Analysis Report, US Environmental Protection Agency, Office of Research and Development, EPA/540/A5-91/009, January 1993.

and no longer has a chemical odor. Chemical testing of shallow soil samples indicated low PAH concentrations. Although phytoremediation was not identified as a presumptive remedy by the EPA, recent demonstrations suggest that this technology could be applicable to the Site, especially to remediate the shallow PAH-impacted soil (see Attachment 3). This technology should be evaluated in light of the $58 million cost associated with the preferred remedy.

19. The remedy evaluation and selection process failed to adequately consider alternate on-site, ex situ remedial approaches that could be more cost effective than the preferred alternative identified in the Proposed Plan.

The EE/CA considered only a limited number of on-site, ex situ treatment alternatives, and they were generally all eliminated because of the residential nature of the area and a lack of space. However, if houses were to be demolished and relocated (as would be the case for the preferred remedy), significant space could be made available, and such a process could be less disruptive to the community by reducing truck traffic, and could be completed for a much reduced overall project cost As a result, the EPA's preferred remedy should be reconsidered in light of the potentially effective on-site, ex situ remediation approaches available.

Ex situ remediation approaches that could be conducted on-site and that have been successfully utilized at other creosote sites include bioremediation, thermal desorption, asphalt batching, and soil washing. Although some excavated materials may be classified as a hazardous waste, the EPA could designate the excavation/ backfill area and the ex situ treatment unit as part of a Corrective Action Management Unit (CAMU), and Land Disposal Restrictions (LDRs) and Universal Treatment Standards (UTSs) would not be triggered [20], and the alternative could satisfy all ARARs. As presented in EPA's Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites (Attachment 1), ex situ bioremediation and ex situ soil washing were two of the most commonly selected remedies presented in RODs for creosote sites. Estimated costs for ex situ biological treatment remedies are approximately $50 to $150 per cubic yard of material[21], which are far less than the costs for excavation and offsite incineration. Estimated costs for on-site thermal desorption are approximately $100 to $200 per cubic yard (see Attachment 3), which are also far less than excavation and off-site incineration.

[20] Presumptive Remedies of Soils, Sediments, and Sludges at Wood Treater Sites, US Environmental Protection Agency, Office, of Solid Waste and Emergency Response, Directive 9200.5-5-162, EPA/540/R-95/128, (page 20) December 1995.

[21] Ibid.

With regard to the space limitations stated in the Proposed Plan for such on-site, ex situ remedies, sufficient space would be made available by the removal of houses as currently proposed by the EPA. For example, a typical thermal desorption unit and associated equipment can be laid out in an area of approximately 120 feet by 120 feet which would only occupy approximately two properties if located on-site (10 to 19 properties are considered in the Proposed Plan for permanent relocation).

The Proposed Plan also indicates that on-site, ex situ remedies were eliminated from consideration given the residential nature of the area. This reason is considered to be invalid because the community disruption that would be associated with on-site, ex situ treatment is insignificant as compared to the site disturbance associated with implementation of the preferred remedy (e.g., resident relocation, house demolition, site-wide excavation, emission control structures, truck traffic, etc.).

Given the lack of consideration in the EE/CA, the proven acceptability, effectiveness, and low cost of on-site, ex situ remedies for other creosote contaminated sites, and the actual availability of the required space for such processes, these options should be fully reconsidered prior to the selection of a preferred remedy.

20. The remedy evaluation and selection process failed to adequately consider alternate off-site, ex situ remedial approaches that could be more cost-effective than the preferred alternative identified in the Proposed Plan.

Because the remedy evaluation and selection process failed to adequately consider alternate off-site, ex situ remedial approaches that could be more cost-effective than the EPA's preferred alternative identified in the Proposed Plan, the evaluation and selection of a preferred remedy is based on a flawed analysis.

The Proposed Plan states that "incineration is believed to be the only available option for off-site treatment" because of the absence of other facilities permitted to accept RCRA-hazardous wastes. However, a review of available facilities indicates that permitted, off-site thermal desorption units exist in New Jersey which could potentially accept the materials, and the materials could also potentially be sent to a recycling facility for incorporation into asphalt (as was done for the creosote-impacted materials at the Utah Power & Utah/American Barrel Superfund Site in Salt Lake City, Utah, see Attachment 2). Landfills and related facilities in Canada which could accept the materials have also been identified. Such facilities present potentially significant cost savings as compared to off-site incineration (costs of $40 to $150 per ton as compared to $700 to $1,000 for incineration), and the lack of consideration of such facilities reflects the incomplete nature of the identification and evaluation of potential remedial options. Because of the significant cost savings potentially afforded by such facilities, any remedial options involving off-site disposal of excavated materials should re-consider the available alternatives to off-site incineration.

21. The remedy evaluation and selection process failed to adequately consider alternate on-site containment remedial approaches that could be more cost-effective than the preferred alternative identified in the Proposed Plan.

The Proposed Plan indicates that containment options were eliminated from consideration as a result of uncertainties associated with containment and EPA's determination that the canal and lagoon areas comprise principal threat wastes. However, containment options are among the most common, proven and reliable remediation approaches, and EPA guidance states that the treatment of principal threat materials should not be conducted if implementation of the remedy would result in greater overall risk to workers or the surrounding community during implementation[22]. Because the EPA's preferred alternative likely increases short-term exposure risks, and because current risks were determined by the ATSDR to be acceptable, other options such as containment should be reconsidered (consistent with EPA's Principal Threat Guidance) prior to the selection of a remedy for the site. For example, traditional containment measures such as capping, vertical barrier walls (a.k.a., slurry walls), and ground water pump and treat could result in much reduced short-term risks, lower impacts to the community, and lower costs. If it is assumed that houses are to be removed and relocated as would be done for the preferred remedy in the proposed plan, significant containment and redevelopment options (e.g., for industrial or commercial uses) exist that were not identified or evaluated in the EE/CA or Proposed Plan. Even if all houses required removal and/or relocation to facilitate implementation of a protective remedy for the site (i.e., ground water recovery and treatment asphalt capping, and commercial/industrial redevelopment), estimated costs for such a remedy would be significantly less than those for the preferred remedy. Similarly, the industrial/commercial redevelopment of this site would be consistent with EPA and New Jersey initiatives and regulations regarding the appropriate and risk-based redevelopment of contaminated properties. As a result of the omissions in EPA's evaluation, the remedy evaluation and selection process needs to be re-conducted prior to the designation of a preferred remedy.

[22] A Guide to Principal Threat and Low Level Threat Wastes, US Environmental Protection Agency, Office of Solid Waste and Emergency Response, Superfund Publication: 9380.3-06FS, November 1991.

Table 1
Summary of Potential Costs and Risks for Aftemate Remedial Options
Federal Creosote Site
Manville, New Jersey

Remedial Option	Unit Treatment Cost	Total Estimated Cost	Short-Term Exposure Risks
EPA's Preferred Remedy (Off-Site Incineration)	$510 to $1,000 per ton	$58 to $88 million	HIGH due to significant waste disturbance and traffic
On-Site, Ex-Situ Treatment (Thermal or Biological)	$50 to $250 per ton	$30 to $43 million	MODERATE due to significant waste disturbance.
On-Site, In-Situ Treatment (Thermal or Biological)	$50 to $150 per ton (also, no excavation/backfill)	$23 to $29 million	LOW as a result of minor waste exposure.
On-Site Containment (Cap and Slurry Wall)	Not Applicable	$10to $30 million	LOW as a result of minor waste exposure.

Attachment 1
Documents to Support Procedural Comments on Proposed Remedy

United Stated
Environmental Protection
Agency

Office of Emergency And
Emergency Response
(5102W)

EPA 542-R-94-005
Number 6
September 1994

Innovative Treatment Technologies: Annual Status Report

(Sixth Edition)

Table B-1
Removal Actions: Site-specific Information By Technology Through FY 1993 **June 1994**

Bioremediation (Ex situ)

Region	Site Name, State, (ROD Date)	Specific Technology	Site Description	Media (Quantity)	Key Contaminants Treated	Status#	Lead Agency and Treatment Contractor (if available)	Contacts/Phone
2	GCL Tie and Treating, NY Emergency Response	Composting	Wood preserving	Soil (4,800 cy)	PAHs (Creosote)	In design; Pilot study completed in Jan 1994	Federal Lead/Fund Financed; ERT/REAC	Joe Cosentino 908-906-6983 Carlos Ramos 212-264-5636
4	Southeastern Wood Preserving, MS Emergency Response (Action Memo signed 09/30/90) See also Soil Washing	Slurry phase (preceded by soil washing)	Wood preserving	Soil (12,000 cy)	PAHs (Creosote)	Completed; September 1994	Federal Lead/Fund Financed; OHM Remediation Services Corp	Don Rigger 404-347-3931
5	Indiana Wood Treating, IN Emergency Response (Action Memo signed 10/11/92)	Composting	Wood preserving	Soil (18,000 cy)	PAHs (creosote)	Operational; Completion planned Fall 1994; After 6 months 8 of 9 compost piles below	Federal Lead/Fund Financed; IT Corporation, CMC, Inc. - sbcontractor	Steve Faryan 312-353-9351
6	MacMillan Ring Free Oil Company*, AR Emergency Response (Action Memo signed 11/09/92)	Solid phase	Petroleum refining	Sediments (38,000 cy)	VOCs (BTEX), PAHs (DAF Float)	Being installed; project completion date planned Fall 1995	Federal Lead/Fund Financed; Ridel Environmental Services	Charles Fisher 214-655-222
7	Scott Lumber, NO Emergency Response (Action Memo signed 07/10/87)	Land treatment	Wood preserving	Soil (16,000 cy)	SVOCs (Phenols, PAHs Benzo(a)pyrene)	Completed; Operational from 1987 to Fall 1991	Federal Lead/Fund Financed; Remediation Technologies	Bruce Morrison 913-551-5014

Table B-1
Removal Actions: Site-specific Information By Technology Through FY 1993June 1994

Soil Washing

Region	Site Name, State, (ROD Date)	Specific Technology	Site Description	Media (Quantity)	Key Contaminants Treated	Status#	Lead Agency and Treatment Contractor (if available)	Contacts/Phone
4	Southeastern Wood Preserving, MS Emergency Response (Action Memo signed 09/30/90) See also Bioremediation (Ex Situ)	Soil washing (sand removal, followed by bioremediation of fines	Wood preserving	Sludge (quantity unknown), Solids (1,000 cy)	SVOCs, PAHs (Creosote)	Operational; Completion planned Spring 1994	Federal Lead/Fund Financed; OHM Remediation Services Corp.	Don Rigger 404-347-3931
9	Poly-Carb, NV Emergency Response (Action Memo signed 05/14/87) See also Bioremediation (Ex Situ)	Soil Washing	Commercial waste management	Soil (1,500 cy)	SVOCs (Phenols), PAHs (Cresol)	Completed; Operational 7/87 to 8/88	Federal Lead/Fund Financed; Reidel Environmental Services	Bob Mandel 415-744-2290

Table E-1
REMEDIAL ACTIONS: PERFORMANCE DATA ON COMPLETED PROJECTS (continued) **June 1984**

Region	Site Name, State, Dates of Operation	Technology/ Vendor	Media Treated (Quantity)	Key Contaminants Treated	Operating Paramenter	Materials Handling Required	Residuals Management	Comments
4	Brown Wood Preserving, FL 10/88 to 12/91	Land treatment/ Remediation Technologies, Inc. Seattle, Washington	Soil/pond sediment (7,500 cy)	PAHs, defined in terms of total carcinogenic indicator chemicals (TCICs) Criteria: 100 ppm TCICs sampled on 8 subplots Input: Up to 208 ppm TCICs Output: Less than 92 ppm TCICs	Soil treated in 3 lifts Retention time: 4 to 15 months Additives: water and nutrients Mixing rate: tilled once every two weeks	Site preparation (land clearing) Excavation Screening Tilling	Treated material vegetated with grass (no cap) Retention pond constructed for runoff	Further information on this project is available from the <u>Remedial Action Close Out Report</u>.
4	Hollingsworth Solderless, FL 1/91 to 7/91	Soil vapor extraction EBASCO (ARCS contractor)	Soil 60 cy (down to 7 feet deep)	TCE, vinyl chloride Target: total VOCs 1 ppm	In situ	None required	Air emissions vented to atmosphere	Design specifications were very critical. Need to pay close attention to design specifications
4#	Wamchem, SC During 8/93	Thermal desorption Four Seasons Greensboro, NC	Soil (2,200 cy)	Criteria: Acetone - 97 ppm Benzene - 2.43 ppm 1,2-Dichlorobenzene- - 33.43 ppm 1,4-Dichlorobenzene- - 38.06 ppm 2,4-Dinitrotoluene- 3.62 ppm Napthalene - 74.6 Ppm Toulene - 34.5 ppm 1,2,4-Trichlorobenzene- 4.23 ppm Total Xylenes - 67.6 Ppm	Continuous feed 5-7 tons/hr		Catalytic oxidation of off-gas	

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Environmental Remediation Cost Data– Unit Price

4th Annual Edition

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	Other	Unit	Hourly Output	Crew	Factor	Labor	Equip	Mat'l	Total
9001	**Application of Bioculture to Contaminated Soil**	ACRE				20.87	26.43	0.00	47.29
9002	Watering by Truck	MSF	87.12	COFWI	43.56	0.48	0.61	0.00	47.29
9002	**Light Petroleum Hydrocarbon Degraders, Microorganisms**	LB				0.00	0.00	19.88	19.88
9101	L-103 Light Petroleum Biocultures, per Pale	LB	0	N/A	1.00	0.00	0.00	19.88	19.88
9003	**Light Petroleum Hydrocarbon Degraders, 100 Lb Bag, Microorganisms**	EACH				0.00	0.00	1,948	1,948
9102	L-103 Light Petroleum Biocultures, per 100 Lb Bag	EA	0	N/A	1.00	0.00	0.00	1,948	1,948
9004	**Light Petroleum Hydrocarbon Degraders, 1,000 Lb Bag, Microorganisms**	EACH				0.00	0.00	17,490	17,490
9103	L-103 Light Petroleum Biocultures, per 1,000 Lb Bag	EA	0	N/A	1.00	0.00	0.00	17,490	17,490
9005	**Heavy Petroleum Hydrocarbon/Creosote Degraders, Microorganisms**	LB				0.00	0.00	13.25	13.25
9104	L-104 Heavy Petroleum/Creosote Biocultures, per Pale	LB	0	N/A	1.00	0.00	0.00	13.25	13.25
9006	**Heavy Petroleum Hydrocarbon/Creosote Degraders, 100 Lb Bag, Microorganisms**	EACH				0.00	0.00	1,007	1,007
9105	L-104 Heavy Petroleum/Creosote Biocultures, per 100 Lb Bag	EA	0	N/A	1.00	0.00	0.00	1,007	1,007
9007	**Heavy Petroleum Hydrocarbon/Creosote Degraders, 1,000 Lb Bag, Microorganisms**	EACH				0.00	0.00	8,745	8,745
9106	L-104 Heavy Petroleum/Creosote Biocultures, per 1,000 Lb Bag	EA	0	N/A	1.00	0.00	0.00	8,745	8,745
9051	**Bionutrients, 50 Lb Bag**	EACH				0.00	0.00	58.30	58.30
9151	Bionutrients, 50 Lb Bag	EA	0	N/A	1.00	0.00	0.00	58.30	58.30
	Solvent Extraction	Unit	Hourly Output	Crew	Factor	Labor	Equip	Mat'l	Total
8201	**1,500 CY/Month Unit, Site Preparation Charge**	EACH				0.00	0.00	125,000	125,000
3621	1,500 CY/Month Unit - Site Preparation Charge	EA	0	N/A	1.00	0.00	0.00	125,000	125,000
8202	**6,000 CY/Month Unit - Site Preparation Charge**	EACH				0.00	0.00	251,000	251,000
3622	6,000 CY/Month Unit - Site Preparation Charge	EA	0	N/A	1.00	0.00	0.00	251,000	251,000
8203	**18,000 CY/Month Unit - Site Preparation Charge**	EACH				0.00	0.00	415,000	415,000
3623	18,000 CY/Month Unit - Site Preparation Charge	EA	0	N/A	1.00	0.00	0.00	415,000	415,000
8204	**1,500 CY/Month Unit - Mobilize and Assemble**	EACH				0.00	0.00	166,500	166,500
3624	1,500 CY/Month Unit - Mobilization and Assembly	EA	0	N/A	1.00	0.00	0.00	166,500	166,500

33 13 09 Soil Washing		Unit	Output	Crew	Factor	Labor	Equip.	Mat'l	[illegible]
33 13 0903	**Treat 15,000 - 19,999 Tons of Soil, Including Residual Water**	**TON**				**1.89**	**1.79**	**35.00**	**38.[illegible]**
13273 5103	Treatment of 15,000 Tons of Soil, Including Residual Water	TON	20	CODEG	1.00	1.89	1.79	35.00	38.[illegible]
33 13 0904	**Treat 20,000 - 24,999 Tons of Soil, Including Residual Water**	**TON**				**1.89**	**1.79**	**135.00**	**138.[illegible]**
13273 5104	Treatment of 20,000 Tons of Soil, Including Residual Water	TON	20	CODEG	1.00	1.89	1.79	135.00	138.[illegible]
33 13 0905	**Treat 25,000 - 29,999 Tons of Soil, Including Residual Water**	**TON**				**1.89**	**1.79**	**135.00**	**138.[illegible]**
13273 5105	Treatment of 25,000 Tons of Soil, Including Residual Water	TON	20	CODEG	1.00	1.89	1.79	135.00	138.[illegible]
33 13 0906	**Treat 30,000 - 34,999 Tons of Soil, Including Residual Water**	**TON**				**1.89**	**1.79**	**117.50**	**121.1[illegible]**
13273 5106	Treatment of 30,000 Tons of Soil, Including Residual Water	TON	20	CODEG	1.00	1.89	1.79	117.50	121.1[illegible]
33 13 0907	**Treat 35,000 - 39,999 Tons of Soil, Including Residual Water**	**TON**				**1.89**	**1.79**	**117.50**	**121.1[illegible]**
13273 5107	Treatment of 35,000 Tons of Soil, Including Residual Water	TON	20	CODEG	1.00	1.89	1.79	117.50	121.1[illegible]
33 13 0908	**Treat 40,000 - 44,999 Tons of Soil, Including Residual Water**	**TON**				**1.89**	**1.79**	**102.50**	**106.1[illegible]**
13273 5108	Treatment of 40,000 Tons of Soil, Including Residual Water	TON	20	CODEG	1.00	1.89	1.79	102.50	106.1[illegible]
33 13 0909	**Treat 45,000 - 49,999 Tons of Soil, Including Residual Water**	**TON**				**1.89**	**1.79**	**102.50**	**106.1[illegible]**
13273 5109	Treatment of 45,000 Tons of Soil, Including Residual Water	TON	20	CODEG	1.00	1.89	1.79	102.50	106.1[illegible]
33 13 0910	**Treat 50,000 - 54,999 Tons of Soil, Including Residual Water**	**TON**				**1.89**	**1.79**	**100.00**	**103.[illegible]**
13273 5111	Treatment of 50,000 Tons of Soil, Including Residual Water	TON	20	CODEG	1.00	1.89	1.79	100.00	103.[illegible]
33 13 0911	**Treat 55,000 - 59,999 Tons of Soil, Including Residual Water**	**TON**				**1.89**	**1.79**	**90.00**	**93.[illegible]**
13273 5112	Treatment of 55,000 Tons of Soil, Including Residual Water	TON	20	CODEG	1.00	1.89	1.79	90.00	93.[illegible]
33 13 0912	**Treat >= 60,000 Tons of Soil, Including Residual Water**	**TON**				**1.89**	**1.79**	**82.50**	**86.[illegible]**
13273 5113	Treatment of 60,000 Tons of Soil, Including Residual Water	TON	20	CODEG	1.00	1.89	1.79	82.50	86.[illegible]
33 13 0915	**Mobilize/Demobilize Soil Washing System**	**MI**				**0.00**	**0.00**	**2.11**	**2.[illegible]**
13273 5114	Mobilize/Demobilize Soil Washing System	MI	0	N/A	1.00	0.00	0.00	2.11	2.[illegible]

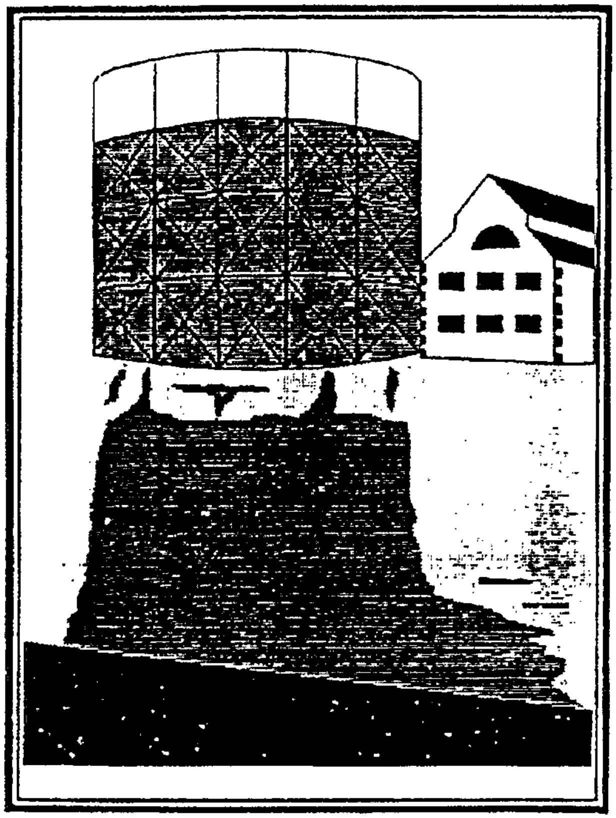
33 14 Thermal Treatment

33 14 01 Incineration		Unit	Hourly Output	Crew	Factor	Labor	Equip.	Mat.	
33 14 0114	**Circulating Bed Combustor, Fixed Cost**	**EACH**				**0.00**	**0.00**	**1,113,000**	**1,113,000**
13277 2273	Circulating Bed Combustor, Fixed Cost with Unit Installation, Monitoring, Operation, Maintenance	EA	0	N/A	1.00	0.00	0.00	1,113,000	1,113,000
33 14 0115	**Supercritical Water Oxidation, Operations Cost**	**TON**				**0.00**	**0.00**	**506.15**	**506.15**
13277 2274	Supercritical Water Oxidation, without Mobilization/Demobilization, Pretreatment	TON	0	N/A	1.00	0.00	0.00	506.15	506.15
33 14 0116	**Supercritical Water Oxidation, Fixed Cost**	**EACH**				**0.00**	**0.00**	**1,325,000**	**1,325,000**
13277 2275	Supercritical Water Oxidation, Fixed Cost with Unit Installation, Monitoring, Operation, Maintenance	EA	0	N/A	1.00	0.00	0.00	1,325,000	1,325,000
33 14 0117	**Advanced Electric Reactor, Operations Cost**	**TON**				**0.00**	**0.00**	**702.51**	**702.51**
13277 2276	Advanced Electric Reactor, without Mobilization/Demobilization, Pretreatment	TON	0	N/A	1.00	0.00	0.00	702.52	702.51
33 14 0118	**Advanced Electric Reactor, Fixed Cost**	**EACH**				**0.00**	**0.00**	**4,001,500**	**4,001,500**
13277 2277	Advanced Electric Reactor, Fixed Cost with Unit Installation, Monitoring, Operation, Maintenance	EA	0	N/A	1.00	0.00	0.00	4,001,500	4,001,500
33 14 02 Low Temperature Thermal Desorption		**Unit**	**Hourly Output**	**Crew**	**Factor**	**Labor**	**Equip.**	**Mat.**	
33 14 0201	**Minimum Mobilize/DeMobilize Charge <=1,000 Mile, Mobile Process Unit**	**EACH**				**0.00**	**0.00**	**84,800**	**84,800**
13277 3511	Minimum Mobilization/Demobilization Charge, <= 1,000 Miles, for Mobile Process Unit	EA	0	N/A	1.00	0.00	0.00	84,800	84,800
33 14 0202	**Additional Mobilize/DeMobilize Charge per Mile, Mobile Process Unit**	**MILE**				**0.00**	**0.00**	**68.90**	**68.90**
13277 3512	Additional Mobilization/Demobilization Charge, > 1,000 Miles, for Mobile Process Unit	MI	0	N/A	1.00	0.00	0.00	68.90	68.90
33 14 0203	**Permitting/Engineering for Site**	**EACH**				**0.00**	**0.00**	**35,000**	**35,000**
13277 3513	Permitting Site with Treatability Studies, Interfacing with Regulator	EA	0	N/A	1.00	0.00	0.00	35,000	35,000
33 14 0204	**Direct Firing, Rental and Operations Cost**	**TON**				**1.51**	**1.44**	**127.50**	**130.45**
13277 2211	Soil Volatilization in Southeast Region	TON	25	CODEG	1.00	1.51	1.44	127.50	130.45
33 14 0205	**Indirect Firing, Rental and Operations Cost**	**TON**				**1.51**	**1.44**	**130.00**	**132.95**
13277 2213	Soil Volatilization in Northeast Region	TON	25	CODEG	1.00	1.51	1.44	130.00	132.95
33 14 0206	**Min Mob/Demob Chrg for Sm Portable LTTD Units <= 1000 mi**	**EA**				**0.00**	**0.00**	**0.00**	**0.00**
13277 3516	Min. Mob/Demob Charge for SmallPortable LTTD Units <= 1000 mi	EA	0	N/A	1.00	0.00	0.00	0.00	0.00

33 19 Disposal (Commercial)

33 19 95 Commercial Disposal (Incineration)		Unit	Hourly Output	Crew	Factor	Labor	Equip.	Mat'l	
33 19 9510	**Nonenergetic Drummed Sludge Incineration, 55 Gallon**	EACH				0.00	0.00	320.00	320.00
13277 2621	Drummed Sludge, Non-Energetic, Amenable to Bulking, 55 Gallon Drum	EA	0	N/A	1.00	0.00	0.00	320.00	320.00
33 19 9511	**Drummed Sludge Requiring Repack Incineration, 55 Gallon**	EACH				0.00	0.00	1,038	1,038
13277 2622	Drummed Sludge Requiring Repacking, 55 Gallon Drum	EA	0	N/A	1.00	0.00	0.00	1,038	1,038
33 19 9512	**Lean Water Incineration for Non-PCB 55 Gallon Drummed Waste**	EACH				0.00	0.00	507.50	507.50
13277 2623	Lean Water Incineration for Non-PCB Drummed Waste, 55 Gallon	EA	0	N/A	1.00	0.00	0.00	507.50	507.50
33 19 9513	**Lab Packs Containing Nonreactive Material Incineration**	LB				0.00	0.00	2.25	2.25
13277 2624	Lab Packs Containing Non-Reactive Material	LB	0	N/A	1.00	0.00	0.00	2.25	2.25
33 19 9514	**Fluorinated Aerosol Cans Incineration**	LB				0.00	0.00	2.53	2.53
13277 2625	Aerosol Cans, Fluorinated	LB	0	N/A	1.00	0.00	0.00	2.53	2.53
33 19 9515	**Nonfluorinated Aerosol Cans Incineration**	LB				0.00	0.00	1.84	1.84
13277 2626	Aerosol Cans, Non-Fluorinated	LB	0	N/A	1.00	0.00	0.00	1.84	1.84
33 19 9516	**Drummed Waste Containing Over 5% Halogen, Extra Charges**	EACH				0.00	0.00	6.34	6.34
13277 2627	Extra Charges for Waste Containing Over 5% Halogen	EA	0	N/A	1.00	0.00	0.00	6.34	6.34
33 19 9517	**Drummed Waste Containing Over 10% Ash, Extra Charges**	EACH				0.00	0.00	3.50	3.50
13277 2628	Extra Charges for Waste Containing Over 10% Ash	EA	0	N/A	1.00	0.00	0.00	3.50	3.50
33 19 9518	**Waste Packed in 85 Gallon Metal Drums, Extra Charges**	EACH				0.00	0.00	57.88	57.88
13277 2629	Extra Charges for Waste Packed in Metal 85 Gallon Drums	EA	0	N/A	1.00	0.00	0.00	57.88	57.88
33 19 9519	**Waste Packed in 85 Gallon Plastic Drums, Extra Charges**	EACH				0.00	0.00	135.00	135.00
13277 2631	Extra Charges for Waste Packed in Plastic 85 Gallon Drums	EA	0	N/A	1.00	0.00	0.00	135.00	135.00
33 19 9520	**Incineration of Bulk Solid Waste (2,000 Lb/CY)**	CY				0.00	0.00	1,526	1,526
13277 2653	Incinerate Bulk Solid Waste	LB	0	N/A	000.0	0.00	0.00	0.76	[illegible]
33 19 9521	**Bulk Liquids, 2,000 to 12,000 BTU, Incineration**	LB				0.00	0.00	0.93	0.93
13277 2642	Bulk Liquids, 2,000 BTU to 12,000 BTU, per Pound	LB	0	N/A	1.00	0.00	0.00	0.93	0.93

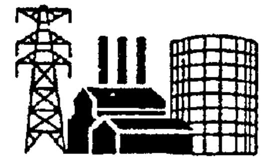
A SUMMARY OF REMEDIAL OPTIONS FOR GAS HOLDERS AT FORMER MANUFACTURED GAS PLANT SITES



by Kurt Prochorena, Ash Jain, and Dennis Unites

Some of the Issues Addressed in This Report:

- The Characterization of Gas Holders
- Waste Treatment Methodologies
- Dewatering
- Removal of Tarry Material
- Treatment Selection
- Excavation Alternatives
- *In Situ* Remediation



ATLANTIC

ENVIRONMENTAL SERVICES, INC. 188 NORWICH AVENUE COLCHESTER, CONNECTICUT 06415 (203) 537-0751

of large volumes of hazardous waste are many. On-site materials handling such as removal of debris, waste mixing and/or stabilization, and loading for transport would need to be conducted under stringent guidelines and may require expensive additional controls such as conducting operations within enclosed structures. Hazardous materials transportation requires special haulers and permits and involves liability in cases of accidental releases. When considering a disposal/treatment option for hazardous materials, transportation costs of approximately $0.15/ton/mile can be expected and can contribute significantly to the overall cost of a remediation program. Finally, facilities permitted to handle hazardous MGP materials are not available for many cost-competitive disposal/treatment methods such as thermal desorption, asphalt batching, utility boiler fuel use, or brick or cement kilns. Incinerators are widely available, but in many cases cost-prohibitive.

Options currently available for the disposal/treatment of hazardous MGP materials are limited to hazardous waste landfills and hazardous waste incinerators. Treatment/disposal of hazardous soils via incineration have been quoted at $1,000/ton to $1,500/ton plus transportation, while landfilling costs can range from approximately $150 to $200/ton plus transportation. Many companies are leery of landfilling hazardous materials due to the long-term liability associated with the waste, since the waste is not destroyed. Also, the landfill option will be available only until land ban rules eliminate the land disposal option completely. Assuming the typical 50 ft (diameter) by 15 ft (depth) holder, approximately 1,090 cubic yards of material could potentially require disposal. this volume could result in incineration costs as high as approximately $2.4 million plus transportation, with landfilling costs of approximately $330,000 plus transportation. The complications and liabilities associated with managing hazardous waste, coupled with limited disposal options and high cost, render excavation and treatment/disposal of hazardous holder materials undesirable.

3.1.2 Excavation of Holder Material as Nonhazardous

If holder materials were characterized as nonhazardous, remediation through excavation followed by on or off-site treatment could be done directly after holder dewatering, if required. Lower costs associated with the management of nonhazardous waste materials would facilitate remedial activities. Numerous options exist for the disposal/treatment of nonhazardous holder materials. Most of the disposal/treatment methods are widely available and, because they deal with nonhazardous waste only, have lower liabilities associated with them.

Treatment via thermal desorption can be conducted on site or off site. Thermal desorption treats nonhazardous wastes to target levels by heating contaminated materials to drive off organic compounds through volatilization. It is not a combustion process, since the material to be treated is not burned. Treatment of contaminated materials at commercial stationary facilities generally ranges from $50 to $100/ton plus transportation, and mobile units for on-site treatment generally range from $100 to $250/ton, plus mobilization and demobilization costs. Using the upper end costs for off-site and on-site treatment of material from the typical 50 ft

United Stated
Environmental Protection
Agency

Office of Emergency and
Development
Washington DC 20460

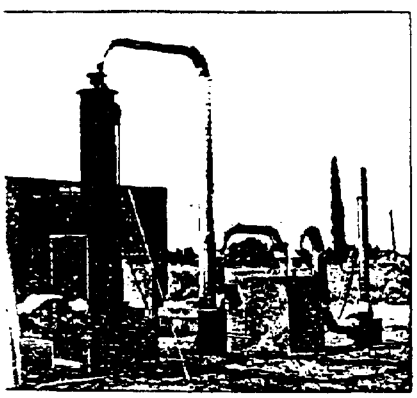
EPA 540/AR-92/015
October 1992

EPA

Demonstration of a Trial Excavation at the McColl Superfund Site

Applications Analysis Report





SITE
SUPERFUND INNOVATIVE
TECHNOLOGY EVALUATION

EPA/540/AR-92/015
October 1992

Demonstration of a Trial Excavation

at the McColl Superfund Site

Applications Analysis Report

Risk Reduction Engineering Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati. OH 45268

tion air will be routed through an emission-control system to Other Equipment prevent the escape of significant air emissions into the area surrounding the excavation zone.

During the trial excavation at the McColl site, a rigid-frame PVC-covered enclosure structure was erected over part of the L-4 Sump prior to the start of excavation. The enclosure proved to be effective in preventing the escape of air emissions during excavation.

Problems Related to Enclosure Structure

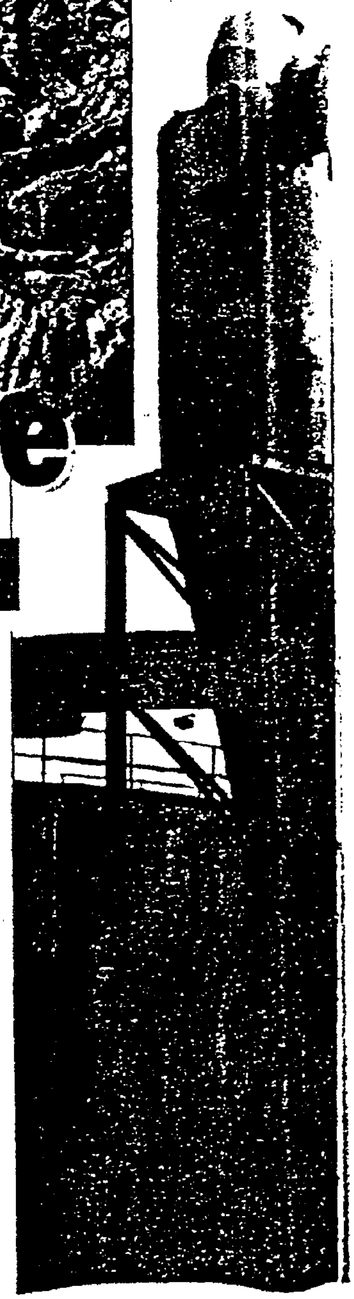
The enclosure created a confined work space in which temperature were approximately 20ºF above the outdoor temperature. During the trial excavation, diesel engines were operated on the trackhoe, backhoe/loader, Bobcat and pug mill. The emissions inside the enclosure resulting in from these engines directly contributed to work stoppages due to low visibility. and high THC levels. The exhaust gasses from diesel engines add heat, particulate manner, and hydrocarbon species to the enclosure air (SO_2 contributions were no doubt small because of the low sulfur content in diesel fuel.)

The high emission levels of SO_2 and THC measured for the tar and char waste materials during the trial excavation caused work stoppages. These were due to health and safety concerns, and interference with equipment steering and braking systems. Since the ventilation air flow rate was fixed, this system was not able to provide enough fresh air to keep pollutant concentrations below design levels

Other Equipment

For the full-scale remediation, one approach would be to use electric engines instead of diesel engines. The pug mill could have been equipped with an electric engine for the trial excavation had the electrical demand requirements not exceeded the available supply on site. Further work should be conducted on the size of the pug mill required for full-scale remediation and the associated power requirements. It also may be possible to use an electrically powered gantry crane system inside the enclosure to move the material and to excavate some or all of the waste materials.

If diesel engines on some of the operating equipment cannot feasiblely be eliminated for the full-scale remediation, a system for directly venting the engine exhaust to the APCDs should be investigated. It may be possible to suspend movable ducting from the enclosure ceiling and to connect it to engine exhausts. Such ducting would directly transport exhaust gases to the APCD system without their entering the enclosure air. This approach would be easiest to accomplish on equipment that does not move about much within the enclosure (i.e., a pug mill or trackhoe). For more mobile equipment, it might be more feasible to direct exhaust gases through a filter, a carbon canister, and a water cooler system mounted directly on the machine. This approach would probably require frequent changing of the filter media, carbon, and water to maintain its changing effectiveness



Utilities finding themselves between a rock and a hard place now have a solution for their MGP soils

Take it to the MART

By Wm. Chip D'Angelo and Anthony Chiesa

Recognizing the need to remediate contaminated Manufactured Gas Plant (MGP) sites, a local utility sought innovative and cost-effective solutions. In response to that need, Casie Protank, a waste transportation, transfer and treatment facility in New Jersey, and American Eco Corp., an international provider of environmental, construction and industrial services, formed Mid Atlantic Recycling Technologies Inc. (MART).

Under a five year agreement with the utility and its prime remediation contractor, MART agreed to commit the necessary resources to finance,

Continues on page 8→

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MGP REMEDIATION USING THERMAL DESORPTION: EMERGING TECHNOLOGY YIELDS A PERMANENT SOLUTION

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ABSTRACT

In 1994, Northwestern Public Service hired Barr Engineering Company to conduct an investigation of a former manufactured gas plant (MGP) at the site for its new operations building. The investigation uncovered evidence of MGP residuals in the moist, clay-rich soils, and Barr worked with Northwestern to remediate the site without causing expensive delays to construction of the operations center. Because this was the first MGP remediation in South Dakota, Northwestern and Barr worked closely with the state's Department of the Environment and Natural Resources to gain the necessary regulatory approvals.

As its remediation method, Northwestern selected on-site thermal desorption. Full-scale on-site thermal desorption has been used at only a handful of MGP sites in the United States, although the technology has been used successfully to treat petroleum compounds. However, thermal desorption offered several advantages over other remediation options, including lower cost and reduced environmental liability, as the soils never left the site. A low-temperature, counter-flow, direct-fired rotary desorber heated soils up to 1200 degrees F to volatilize organic fractions. Soils containing polyaromatic hydrocarbon (PAH compounds were excavated, treated effectively, and reused at the site as backfill.

For the approximately 47,000 tons of soil processed, remediation costs were $82 per ton. Site-specific factors affecting project costs included the volume of soil treated, soil type and condition, inclement weather, and market conditions. Soils were treated to below state-approved performance criterion, and remediation of the site was completed just 18 months after the project began.

Conservative assumptions were made regarding the most probably future land-use scenario, potential receptors, and routes of exposure. The risk-based treatment performance criterion of 43 milligrams per kilogram for the sum of carcinogenic PAH compounds was developed using equations set forth in published EPA guidelines. The SD DENR approved the treatment performance criterion.

The second phase of the remediation began in March 1995 and was completed in September 1995. During this phase, the remaining soils with PAH concentrations exceeding the excavation criteria were excavated, then soils from both phases were treated by thermal desorption and used as backfill on site.

Thermal Desorption: How It Works

In choosing thermal desorption, Northwestern selected a technology that, although widely used to treat petroleum compounds, is still a relatively new method for remediating MGP soils. Full-scale on-site thermal desorption has been used at only a small number of former MGP sites in the United States. However, thermal desorption offered several advantages. In addition to being the least expensive method, it also allowed Northwestern to treat MGP soils on site using a mobile treatment unit. On-site remediation was more protective of the environment because it eliminated the need for truck- or railcar-loads of MGP soils to be transported through residential areas and the countryside, thus preventing potential off-site accidents.

The basic steps in the thermal desorption process are material preparation, thermal desorption, off-gas treatment and air emissions control, and cooling and dust control. At the Huron site, a test run was completed to optimize operating parameters of the thermal desorption system before full-scale treatment began. To maximize the efficiency of the system, excavated soils were prepared to render the particle-size range (less than two inches in diameter), moisture content (13–26 percent), and PAH concentrations (84– 1,410 milligrams per kilogram) of the feed stream more homogenous. Soils were stockpiled to reduce moisture content and turned mechanically to accelerate the drying process. Prepared soils were placed into a feed chute equipped with a final screening device to remove any remaining oversized materials. The soils were then conveyed into the thermal desorption unit, a rotary, low-temperature thermal desorption (LTTD) system designed and constructed specifically to remediate materials containing heavy hydrocarbons and polycyclic hydrocarbons, such as PAH compounds (Figure 1). The conveyor system can move between 20-50 tons of soil per hour, depending on the soil type, moisture content, and composition.

The LTTD system has a two-stage, counter-flow, direct-fired rotary desorber, which is 38 feet long and designed to provide the residence time (approximately 18 minutes) necessary to desorb PAH compounds and heavy petroleum products. In the first or low-temperature stage (LTS), the soils are fed in a direction countercurrent to the combustion gases, heated to approximately 300-500 degrees F to remove the light hydrocarbons and water vapor, then passed into the second or high-temperature stage (HTS). The HTS heats soils, as necessary, up to 1200 degrees F, the temperature required to desorb heavy and polycyclic hydrocarbons. These are then routed back through the LTS burner flame and oxidized to lighter hydrocarbons. This recycling increases the system's fuel efficiency because the HTS off-gas material becomes fuel for the LTS. Recycling also lowers the temperature of the off-gas passing through the baghouse, so that it is cool enough not to burn up the baghouse yet still hot enough to inhibit condensation of desorbed organics onto bag filters. The LTS off-gas is directed through the primary baghouse for particulate removal and then through the thermal oxidizer for thermal destruction at temperatures up to 1800 degrees F. The off-gas is discharged into the atmosphere, while the particulate collected in the baghouse is returned to the thermal desorption unit for treatment, then mixed with the treated soils.

The treated soil mixture is cooled, wetted and discharged onto the ground. Fugitive dust emissions from the cooling and wetting process are collected by an auxiliary baghouse and steam is discharged into the atmosphere. At the Huron site, oversized materials and treated soils were used to backfill the

Table 1. Soil Analytical Parameters

Parameter	Target Analytical Detection Limit (in milligrams per kilogram)
Carcinogenic PAH Compounds (U.S. EPA Method 8270)	
Benzo(a)anthracene	1.0
Chrysene/Triphenylene	1.0
Benzo(b)fluoranthene	1.0
Benzo(k)fluoranthene	1.0
Indeno (1,2,3-cd)pyrene	1.0
Dibenzo(a,h)anthracene	1.0
Noncarcinogenic PAH Compounds (U.S. EPA Method 8270)	
Naphthalene	1.0
2-Methylnaphthalene	1.0
Acenaphthlene	1.0
Acenaphthylene	1.0
Dibenxofuran	1.0
Flourene	1.0
Phenanthrene	1.0
Anthracene	1.0
Fluoranthene	1.0
Pyrene	1.0
Benzo(g,h,i)perylene	1.0

DISCUSSION

Factors Affecting System Performance

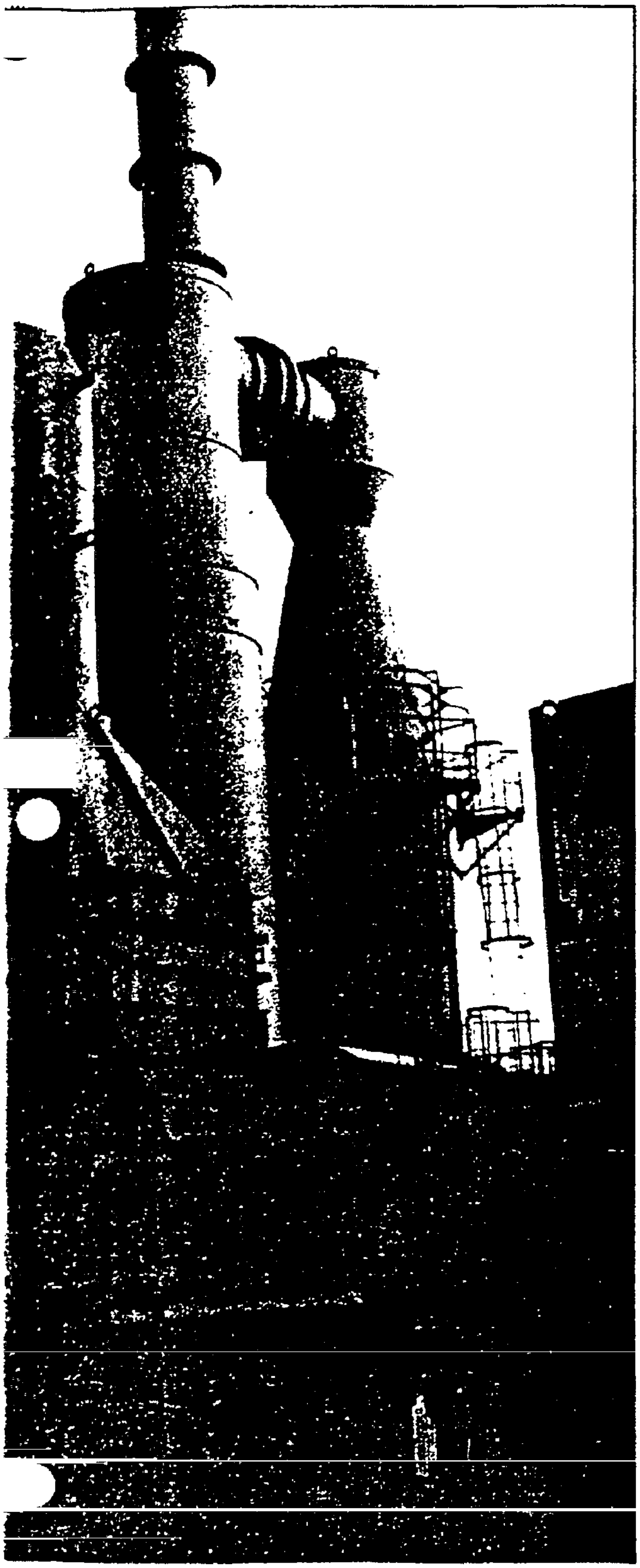
Several factors affected treatment process performance. Performance evaluation was based on the extent to which the process could minimize site preparation activities, soils preparation, and fuel consumption; maximize feed rates; and meet schedule requirements. For example, at the Huron MGP site, the operator's experience and familiarity with the thermal desorption system being used and treatment of similar soils minimized the time necessary for setup, startup, and troubleshooting. Site preparation and setup times were reduced because electricity and natural gas were available at the site and there was no need to construct additional utilities.

Soil characteristics also affected the treatment process. The high clay and moisture content of the soils increased the time and labor necessary for soil preparation. The soils were cohesive, which

CONCLUSIONS

At the Huron site, the thermal desorption system effectively treated wet, clay-rich soils containing PAHs and VOCs. The system showed good operating stability and kept critical parameters constant, with feed rates averaging 26 tons per hour, HTS desorber temperatures between 1050–1200 degrees F, residence times consistently averaging 18 minutes, oxidizer temperatures between 1741–1773 degrees F, and oxidizer residence times averaging 2–2.5 seconds. Stack emissions stayed within operating permit requirements. While there were site-specific factors adversely affecting remediation costs (inclement weather, soil type and moisture content), other factors (market conditions, available utilities) had a positive effect. Remediation was completed 18 months after the project began and construction of the new operations building was not delayed. The successful cleanup of the Huron MGP site has also provided benefits to an extended circle. The Electric Power Research Institute funded a portion of the project as a field demonstration and published Barr's report on costs and technical issues to make that information available to utilities nationwide.

Northwestern Public Service provided a permanent solution for MGP residuals at the site, protecting the environment now and for generations to come. In May 1996, EPA Region VIII recognized Northwestern's remediation of the site with an Outstanding Achievement Award for leadership and innovation.



MART, from page 6

construct and operate a low temperature thermal desorption facility in Vineland, N.J., specifically to process MGP and other total petroleum hydrocarbon (TPH) contaminated soils. The facility took seven months and $9 million to construct. MART began accepting MGP soils in July 1997.

The problem

The more than 1500 MGPs constructed from the early 1800s to the mid-1900s produced gas by heating coal, coke or oil for city lighting, home and business use.

Wm Chip D'Angelo is chief executive officer and Anthony Chiesa is director of business development of Mid Atlantic Recycling Technologies Inc., Vineland, N.J.

The by-products of the MGP include coal and oil tars, sludges, purifier box wastes and gas-scrubbing wastes. Historically, these by-products were transported offsite for disposal, reused in other industrial processes or buried onsite.

With the construction of the interstate natural gas pipeline and regional gas storage facilities, MGP operations became obsolete. In most cases, these sites were cleared of aboveground structures, backfilled and left vacant. The gasification by-products and facility support structures remained out of sight, and often, out of mind. Site owners, who are mostly public utilities, are now faced with the responsibility of converting these underused assets and liabilities into income generating properties.

The technology

MART uses an Astec/SPI low temperature thermal desorption unit (TDU) fully permitted by the New Jersey Department of Environmental Protection to process contaminated soil to Residential Direct Contact Standards.

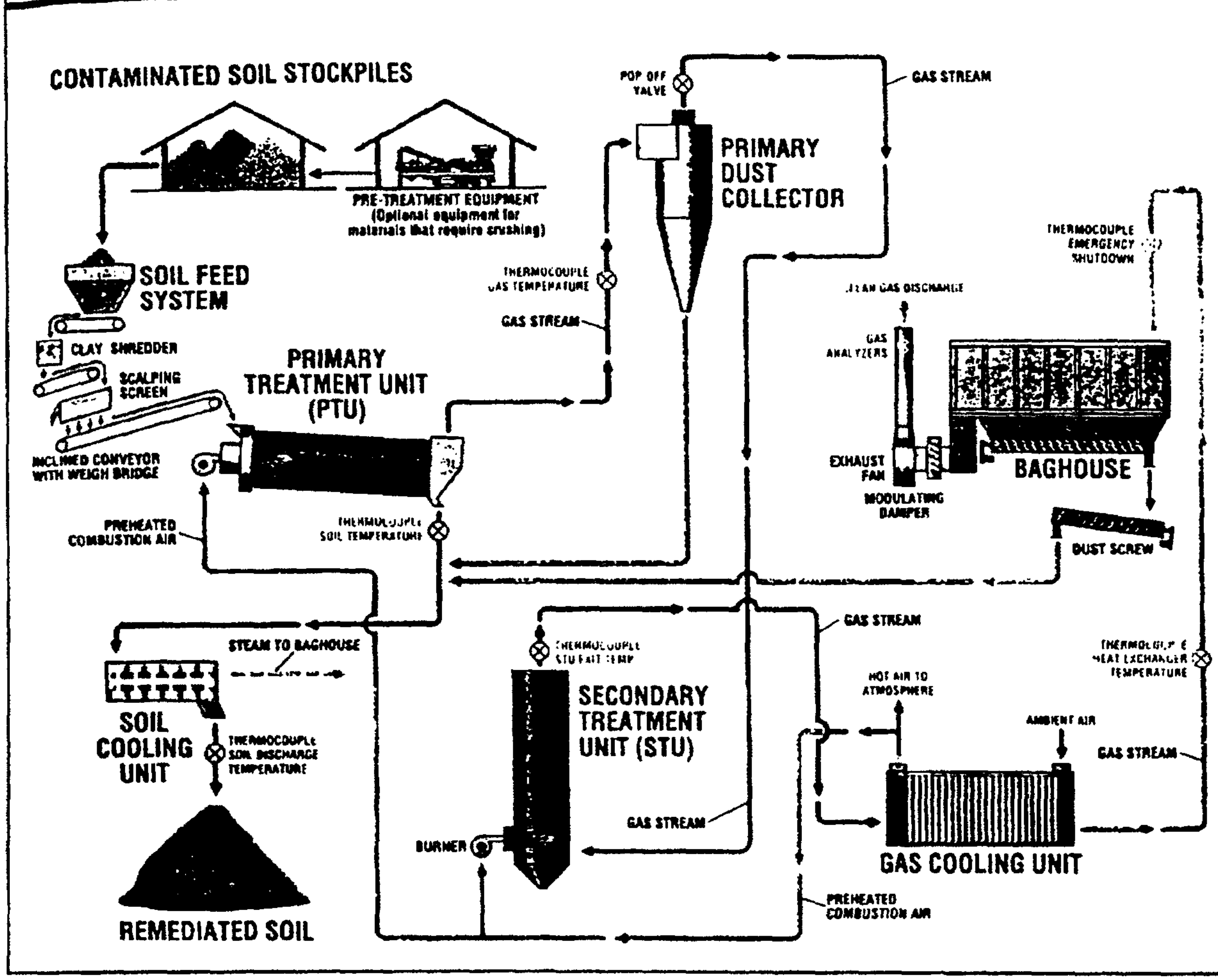
Non-hazardous (per 40 CFR 261, 264, 279) petroleum-contaminated soils are received by MART and sampled for TPH, VOCs and metals to confirm conformance with contract specifications. Upon acceptance, the soil is screened and crushed to less than 8 cm and process through the TDU. See Figure 1, page 9.

Once processed, the soil is analyzed for conformance with N.J. Residential Direct Contact Standards. The treated soil is returned to the generator as fill material, or stored onsite for beneficial reuse, such as landfill cover. The facility accepts almost 1100 metric tons per day and can treat about 900 metric tons per day.

The 45 metric ton-per-hour unit is capable of reaching material treatment levels of 540° C. The TDU is equipped with a continuous emission monitor and data is submitted to the state to ensure

Figure 1

How Contaminated Soil Is Remediated Using LTTD



compliance with air permit requirements. See figure 2, this page, for MART's typical operating conditions.

MART is in the process of complimenting the Astec TDU with a hazardous waste minimization treatment and recovery system, called the SAREX system. Manufactured by SRS, of Irvine, Calif., the SAREX system is capable of treating PCBs, PAHs and RCRA wastes, including K and F waste codes. The SAREX system combines three distinct processes — MX-1500 Three Phase Centrifuge, MX-2000 Low Temperature Thermal Desorption Unit and the MX-2500 Medium Temperature Thermal Processor, in series — to minimize the disposal of wastes and maximize the recovery of useful products generated during separation and remediation.

MGP case study

With more than 10 former MGP sites scheduled for remediation, the local utility client authorized project

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Figure 2: Process Parameters

Soil feed rate	36 to 45 metric tons/hour
Soil moisture	15 to 20 percent
MGP/TPH feed (max)	3 percent
Primary Treatment Unit	480° C
Fuel input	37.72 mm BTU/hr
Secondary Treatment Unit	980° C
Fuel input	33.84 mm BTU/hr
Stack discharge	190° C
VOC removal	>99 percent
Particulate removal	>99.5 percent

MART, from page 9

Figure 3: TDU performance Soil Concentration (ppb)			
Compound	Contaminated	Treated	Cleanup level
Anthracene	4,000	41	100,000
Benzo(a) anthracene	3,000	55	900
Benzo(a) pyrene	4,000	43	660
Benzo(k) fluoranthene	3,000	49	900
Chrysene	5,000	41	9,000
Pyrene	5,000	80	100,000

activity to begin during Summer 1997. The first site was in an urban, high traffic area where local governmental and community leaders wanted to use the vacant MGP site for a new office complex. The primary objective of the project was to excavate and transport contaminated MGP soils to the MART facility, and subsequently return the thermally treated and certified clean soil to the site as backfill.

The project began in July 1997 and continued for 16 weeks. During that time, more than 27,000 metric tons of MGP soil and debris was processed. See Figure 3, this page. All materials treated reached the specified cleanup standards on the initial pass. The project was completed without disrupting local traffic or creating an environmental/ health hazard to the local community. The land was seeded and turned over to the community for beneficial use.∎

Transportable Incinerator Economically Treats Creosote-Contaminated Soil

◆ **Problem:** Contaminated lagoon sludge from a bankrupt wood treating operation in Prentiss, Mississippi, threatened to overflow into a nearby stream. An emergency response contractor excavated and stabilized the coal tar creosote sludge with cement kiln dust in March 1987.

While this removed the immediate threat to the environment, the organic contaminants were known or suspected carcinogens, and a permanent solution was needed. Twenty-five years of contamination was now stockpiled, totaling 9,200 tons of creosote-containing soil.

◆ **Solution:** The Environmental Protection Agency (EPA) Region IV selected Williams Environmental Services, Inc., an environmental contractor, to clean up the Superfund site. Incineration was chosen as providing the only environmentally sound alternative and was selected over burial on site or off-site landfilling.

Contaminated soil was sampled and tested at the beginning of the project. Data on composite samples, prepared from over 80 core samples, showed the soil was relatively high in heating value, at 1148 Btu/lb dry basis *(Table 1)*. While the heating value was high, on the average it did not exceed the heat input limits of the kiln incinerator at rated capacity. Heating value is a key parameter, as high heating values reduce incinerator throughput due to limitations on heat release rates and flue gas volumes.

Soil contained seven polynuclear aromatic hydrocarbons (PAH). These organic compounds *(Table 2)* are consistent with major creosote constituents noted in wood treating literature. No pentachlorophenol or arsenic compounds were found and only small amounts of inorganic chloride were discovered. Inorganic and organic sulfur was present in small quantities.

Table 1
Soil Analysis*

	– Weight % (wet basis) –	
	Proximate	Ultimate
Water	10.07	10.07
Ash	82.18	82.18
Volatiles	6.95	
Fixed Carbon	0.80	
C		6.90
H		0.46
N		0.22
S		0.13
Cl		0.12
O_2	By difference	
Total	100.00	100.00

* *Composite core samples*

Table 2
PAH Analysis*

Compound	mg/Kg
Phenanthrene	1400
Naphthalene	1100
Anthracene	1100
Acenaphthene	1000
Fluorene	900
Pyrene	220

* *Composite core samples.*

Characteristics of the actual soil fed to the incinerator varies somewhat from the composite samples. However, blending prior to incineration reduced the amount of variation.

To burn out the organic hazardous waste, Williams constructed and operated the industry's largest transportable rotary kiln incinerator system. The overall processing system *(Figure 1)* com-prises four major components: feed preparation; incineration; ash handling and conditioning; and air pollution control *(Figure 2)*.

In the soil feeding system *(Figure 3)*, front-end loaders move contaminated soil to the staging area, a roofed concrete pad. Soil is fed to a vibrating screen that removes material larger than 2 inches, which is stockpiled for disposal by EPA.

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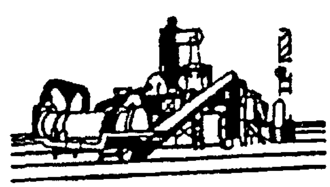

Remediation Through Proven Technology

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Solids exiting the kiln are gravity conveyed by chute into a rotary cooler, 7 feet 3 inches in diameter and 29 feet long. Water is added to moisturize the decontaminated soil to minimize dust emissions and promote compaction. Steam is vented from the cooler to the secondary combustion chamber inlet.

Gases exiting the kiln pass through a cyclone dust collector where entrained particulates are removed prior to entering the secondary combustion chamber. A portion of the gas exiting the cyclone is diverted to the dryer/conditioner to partially dry the soil. Dryer/conditioner exit gases are returned to the inlet of the cyclone.

Temperature of the gas leaving the cyclone can be increased to as high as 2200°F in the secondary combustion chamber at a residence time of two seconds. A more typical temperature level used for this waste was 1700°F. This chamber is equipped with a "high swirl" design burner with a rating of 45 million Btu/hr. To ensure complete combustion, a minimum of 3% excess oxygen is maintained in the secondary combustion chamber exit gas.

Gases then enter a quench tower, where they are cooled to 350°F by atomized water, and passed to a baghouse where particulates are removed by 480 Nomex bags, 6 inches in diameter and 10 feet long. Use of the baghouse eliminates quantities of sludge which would have been produced by a wet scrubber such as a high-pressure venturi particulate scrubber. It also does a better job of removing fine salts and metals, which may be formed by vaporization in the incineration process.

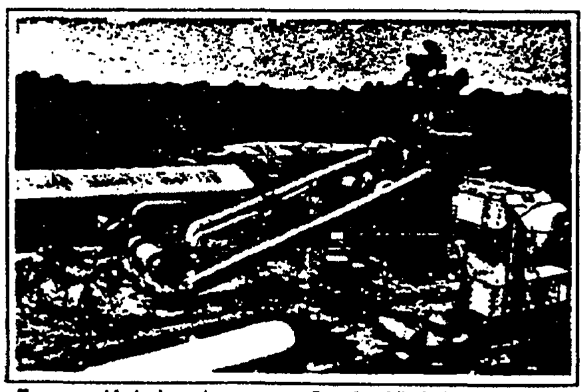
Dust collected from the secondary combustion chamber, quench tower and baghouse is conveyed to a pug mill. Here it is mixed with water and discharged onto the final belt conveyor which takes the ash to storage.

After the baghouse, flue gases pass through a 350-horsepower, induced draft fan. Since the fan operates on clean, hot gas that is well above its dewpoint, any maintenance or reliability headaches that could have been caused by wet, dirty gas are eliminated.

The fan is followed by an acid gas absorber where HCl and SO_2 are removed. Gases are saturated in the unit's low-pressure-drop venturi inlet section.

Processed soil is sprayed with water to minimize dust and temporarily hold in conical piles with a volume equal to 24 hours of output. Samples are taken to ensure the soil is clean, less than 100 ppm PAH. Clean soil is periodically moved to a simple diked area near the rear of the site for final disposal.

Scrubber blowdown liquor and equipment washwater pass through a sediment filter and an activated carbon absorber and stored in a 25,000-gallon tank. This water is used to cool the process soil as well as to control dust at the final disposal site. There is no discharge of wastewater.



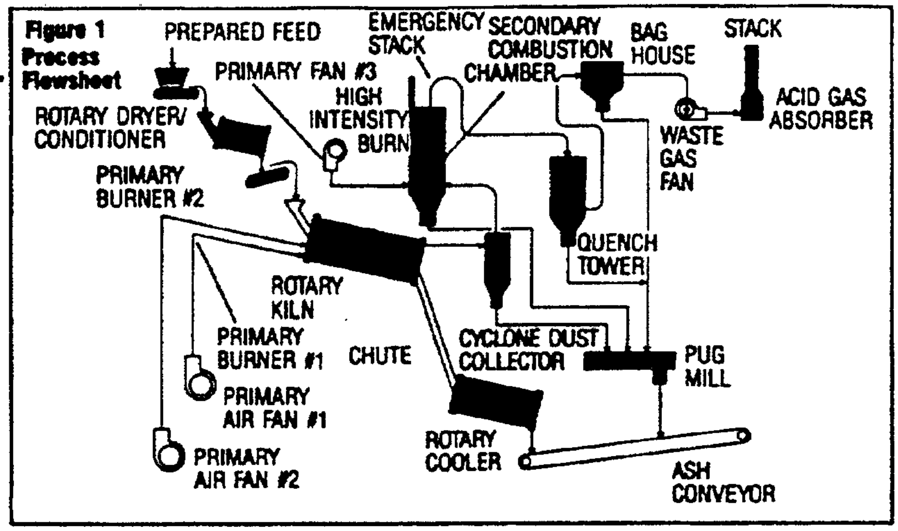
Transportable incineration system at Prentiss, Mississippi, one of the first to treat creosote waste, would be applicable to petrochemical and refinery material.

Material less than 2 inches, stockpiled on the pad, goes into the hopper of the apron feeder for the weighbelt scale serving the dryer/conditioner. This unit partially dries the soil, breaks up large agglomerated particles, and homogenizes the feed to the kiln. Since the creosote was stabilized, the ability of this unit to break up the soil lumps is particularly beneficial to the kiln's operation. The final unflighted section of the dryer/conditioner also micropelletizes the fines fraction of the soil in a fashion similar to a ball mill.

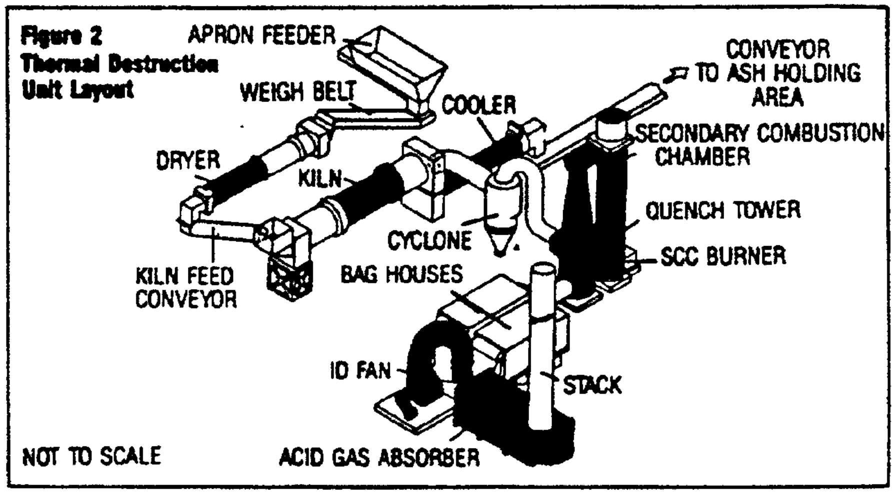
Solids move in a closed conveyor from the dryer/conditioner to the rotary kiln, where drying is completed and creosote compounds are volatilized and burned. Operation is concurrent, with both gas and solids exiting the rear of the unit. The kiln is operated to maintain an exit gas temperature of approximately 1600°F and an oxygen content of >3%.

This was the third kiln of this size the supplier built for hazardous waste destruction. The unit is 7.5 feet in diameter and 45 feet long, with a total of 6 inches sprayed refractory; 3 inches of insulating grade; plus a 3-inch top coat of hardface. This refractory thickness is carried through the top half of the downstream quench tower.

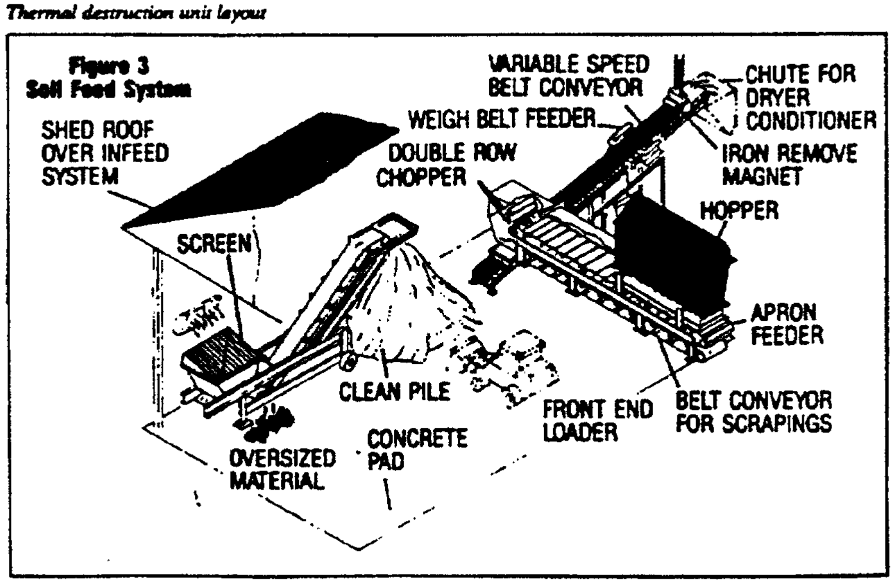
The kiln has two 18 million Btu/hr burners. One produces an intense flame, via a custom secondary air scroll, to rapidly dry the solids and initiate volatilization of the organics. The other burner has a long flame to burn the volatiles.



Process flow sheet



Thermal destruction unit layout



Soil feed system

Instrumentation and Control

Major variables monitored are: flow of contaminated soil, fuel and air; temperatures, pressures, and process gas stream constituents. Automated process control loops, "smart controllers", are used to regulate kiln and secondary combustion chamber temperatures and spray tower outlet temperature. Sheathed Type K thermocouples, shielded from direct flame radiation, sense the combustion temperatures. They are installed well into the combustion gases to ensure accuracy. The weighbelt readout in the control room gives instantaneous soil feed rate in tons/hour and integrated totals *(Table 3)*.

A flue gas sample conditioning system extracts gases from the acid gas absorber stack and feeds them into continuous analyzers for regulatory compliance evaluation and process monitoring and control. Flue gas is analyzed for O_2, CO_2, CO, total unburned hydrocarbons (TUHC), and NO_x. A backup monitor is provided for CO. Analyzers also determine oxygen level in situ at the kiln exhaust and at the outlet of the secondary combustion chamber. The following data are recorded continuously:

- Waste soil feed rate
- Combustion gas velocity
- Secondary combustion chamber exit temperature
- Stack gas carbon monoxide concentration
- Particulate loading
- Absorber water flow rate
- Kiln and dryer draft
- Baghouse inlet temperature

Table 3
Incinerator Performance Specifications

Waste soil rate (wet basis @ 15% moisture), tons/hr	15
Solid residence time (minimum), minutes	45
Kiln size, ft	
Diameter	7.5
Length	45
Kiln outlet gas temperature, °F	1200-2000
Kiln outlet oxygen concentration, %	≥3
Secondary combustion chamber outlet temperature, °F	1500-1800
Secondary combustion chamber outlet oxygen concentration, %	≥3
Secondary combustion chamber residence time @ 2200°F, sec	2
Burner rated capacity (maximum), MM Btu/hr	82
Baghouse inlet temperature, °F	350
Particulate loading after baghouse, gr/dscf	<0.08
HCl removal efficiency (if 4 lbs/hr), %	>99
Fuel for burners	Propane or natural gas

Data are captured on three-pen strip chart recorders and printed out on a 48-channel data logger.

Startup and Operation

Operations commenced in April 1988 with clearing and grubbing of the site, followed by equipment erection and checkout. Incineration of soil began on July 27 and the unit achieved 100% capacity within seven weeks.

The primary problem encountered during startup was caused by the higher than expected fines content of the soil. Cement kiln dust used as a stabilization reagent and local clays produced an extremely fine ash. Approximately 50% of the ash output was from the air pollution control system, cyclone through baghouse. The original conveyors on this system were, therefore, undersized and were replaced with two-foot-diameter screw conveyors. A conveyor was added to the secondary combustion chamber to remove fine solids which accumulated there.

Slagging occurred on two initial shakedown runs, resulting in agglomeration of the ash. This was solved by running at lower temperatures, and by relocating the kiln exit thermocouple which had been reading low due to seal air leakage.

Initial "miniburn" tests showed inconsistent destruction removal efficiency (DRE). This was due to a duct, which collected steam and dust from the product cooler, being vented into the baghouse. This line was rerouted into the secondary combustion chamber to prevent bypassing of organic contaminants.

General mechanical problems occurred in the materials handling system, principally with the apron feeder. The problems were solved by upgrading individual drive components and by consistent loading of the apron feeder hopper.

A trial burn was performed on October 11 and 12, 1988. Naphthalene was used to test overall incineration destruction efficiency. It was selected as the principal organic hazardous constituent (POHC) because of its relatively high stability ranking (rated 5th highest out of 320 in EPA's Thermal Stability-Based Incinerability Ranking). No spiking was done since naphthalene was present in ample concentrations in the soil along with a variety of other polynuclear organic compounds. The natural soil concentration was measured and used to calculate infeed loading and DRE.

The trial burn *(Table 4)* consisted of three runs at two test conditions. The first test condition used a kiln temperature of 1620°F and a secondary combustion chamber temperature of 1670°F. The second trial burn test condition used a kiln temperature of 1570°F and a secondary combustion chamber temperature of 1710°F. For both, the average waste feed rate was just above the 15 tons/hour design rate for the incineration system.

The incinerator passed the RCRA trial burns with results far exceeding federal and state requirements.

Table 4
Trial Burn Test Results

Test Condition 1:				
Kiln operating temperature, °F				1620
Secondary combustion chamber, °F				1670
Run number	1	2	3	Average
Waste feed, tons/hr	15.1	15.2	15.5	15.3
Naphthalene feed, lb/hr	77.2	48.3	98.7	74.73
Total PAH feed, lb/hr	340	285	418	348
Naphthalene DRE, %	99.9983	99.9988	99.9981	99.9987
Total PAH-DRE, %	>99.9995	>99.9988	>99.9993	>99.9995
Particulate emission rate @ 7% O^2, gr/dscf	0.0130	0.0104	0.0107	0.0113
Test Condition 2:				
Kiln operating temperature, °F				1570
Secondary combustion chamber, °F				1710
Run number	1	2	3	Average
Waste feed, tons/hr	15.9	15.2	14.6	15.2
Naphthalene feed, lb/hr	74.5	70.2	44.7	63.1
Total PAH feed, lb/hr	401	401	282	361
Naphthalene DRE, %	>99.9996	>99.9998	>99.9996	>99.9997
Total PAH-DRE, %	>99.9997	>99.9998	>99.9997	>99.9997
Particulate emission rate @ 7% O^2, gr/dscf	0.0151	0.0121	0.0103	0.0125

Secondary combustion chamber and quench tower combination (right), along with an acid gas absorber, prevent emission of aromatics during soil treatment

Incinerator stack test results showed that during all tests and under both test conditions, the incinerator achieved ≥99.998% DRE, at least five times better than required. DREs for total PAH were, without exception, higher than those for naphthalene. This suggests naphthalene was a good choice for the POHC, for it was more resistant to thermal decomposition than the average PAH compound. DREs were unusually consistent.

DRE data from the second test were all "more than" values, since insufficient POHC was accumulated to quantify. In this case, the limits of detection were used to back calculate a value. DRE for the total PAH compounds was determined to be ≥99.999%, at least ten times better than required by RCRA standards.

An average particulate emission rate of 0.012 grains per dry standard cubic foot (gr/dscf), corrected to 7% oxygen, was found; approximately six times better than RCRA requirements.

Hydrochloric acid gas levels were determined from preliminary tests which indicated the total uncontrolled HCl emission rate, as calculated from the theoretical chlorine feed rate based on soil analysis, would be less than the 4.0 lb/hr EPA limit. Actual stack concentrations were negligible, less than 0.1 lb/hr. Hydrochloric acid gas emissions were not measured during the trial burn, but scrubber efficiency data indicated the scrubber was capable of removing better than 99% of the acid gas in the waste stream at normal input levels.

Thermal destruction unit successfully removed creosote and other polynuclear aromatics from over 9,000 tons of soil.

Sulfur dioxide was generated by organic sulfur in the coal tars. Uncontrolled levels were expected to be in the 160 ppm range. Continuous emission monitoring data during the trial burn showed concentrations to be 0 to 10 ppm, well below the State of Mississippi limit of 500 ppm.

Scrubber blowdown water was found to be clean, with all PAH compounds at less than detectable levels.

Ash tests were performed during the trial burn and on a daily basis throughout the project. All tests showed the ash product to be less than the required 100 ppm total PAH compounds. Typically, the total PAH level was less than 5 ppm in 92% of the samples, with many of the tests showing all compounds to be less than the detectable level.

◆ **Results:** The entire stockpile was decontaminated by Williams in less than a year from the December 22, 1987 contract date. Total project was performed for a little over $1.83 million, and slightly more than 9,129 total tons were incinerated, for an average price of about $199/ton. This was for "chute to chute" incineration and did not include extensive excavation or field sampling work.

This marks the first field remediation project involving the incineration of creosote wastes. Experience gained by Williams is directly applicable to remediation efforts for other coal tar by-products resulting from coal gasification or coking operations and for petrochemical and refinery wastes. ■

ASPHALT-BATCHING OF CREOSOTE WASTES

 Cunningham-Davis Environmental (CDE Resources, Inc.) CDE Soil Recycling Technology Description Introduction , History and Current Development, Process Description, Government Involvement, Performance, Limitations, Capacity. Material Handling, Waste Streams, Operator Requirements, Utilities, Set-Up/Tear-Down, Reliability/Maintainability, Public Acceptance, Information Sources 1. Introduction Cunningham-Davis Environmental (CDE) has developed a technology for ambient temperature recycling of petroleum hydrocarbon-, metal-, and creosote- contaminated soils and sludges. After ex situ remediation with proprietary emulsions and regents, the soils and sludges are recycled into construction-grade products, such as base pavement, engineered fill, landfill liners, and caps (D16398Y, p. 1). 2. History and Current Stage of Development This technology is commercially available. 3. Process Description This technology includes water-based asphalt emulsions, reagents, and setting agents which coalesce petroleum hydrocarbon or other organic-contaminated soils into stable, non-leaching matrices. For metal-contaminated soils, a series of reagents which fix the solubility of target metals is used. The metal treatment process may be followed or combined with the CDE emulsion process. Soil can either be processed at the client's location or at one of CDE's locations (D16398Y, p. 3). According to the vendor, the asphalt concrete produced by this technology contains 65% to 75% contaminated soil and has optimal flow rates and stabilities better than standard hot mix asphalt. The cure time is usually 3 to 4 hours (D16398Y, p. 1). Conventional cold mix asphalt concrete typically has stabilities inferior to hot mix pavement. The CDE asphalt, however, is an improved cold mix asphalt which achieves Marshall stabilities in the 3,500 to 6,000 pound range, which is two to three times better than the stability of hot mix asphalt concrete (D16398Y, p. 4). 4. Involvement With Government Programs/Regulatory Acceptance According to the vendor. CDE's approach to soil recycling started as a result of its work as a U.S. Department of Energy (DOE) contractor (D16398Y, p. 2). CDE has also successfully permitted fixation and stabilization projects with regulatory agencies including several California Regional Water Quality Control Boards and the California State Department of Toxic Substances Control (Personal communication, Gordon Dickson, CDE, 1997). 5. Performance A pilot study was conducted with soils that had been contaminated with petroleum hydrocarbons (primarily diesel) during operations at Fort Irwin National Training Center. The mix used for the asphalt concrete paving matrix was 65% contaminated soils, 25% aggregate, and 10% emulsion and setting agents. Approximately 2,700 tons of soils were recycled. Samples were collected at 500 ton intervals and analyzed by the waste extraction test (WET) for total extractable petroleum hydrocarbons and total recoverable petroleum hydrocarbons; none were detected. Processing averaged 220 tons per hour. The goal was to have a finished paving product with Marshall Stability Strength test results exceeding 2,500 pounds compressive strength. Ibis was consistently achieved (D16398Y). At a former maintenance yard site in San Bernardino, California, owned by the Santa Fe Railroad, the soil was contaminated with fuel oil and diesel. The goal for pavement stability was 3,500 pounds. The CDE technology yielded asphalt with consistently greater than 3,000 pounds and typically in the 5,000 to 7,000 pound range. Leaching tests with the California STLC test resulted in no detections of contaminants of concern with the treated material. The site was subsequently developed into a intermodal container terminal. A pugmill was used for mixing the -soil and reagents. Up to 300 tons per hour of soil was treated. The mix used was about 75% soil, 19% aggregate, and 6% emulsifier and binder (D 118770). 6. Limitations The characteristics of a soil determine the cost effectiveness of the recycled product. Sandy, silty, and cobble soils are more suitable for recycling into asphalt concrete. Conversely, clay-rich soils are most effectively recycled into a low permeability liner. Soil or rock aggregate can be used to supplement soils as needed (D16398Y, p. 5). All information is from the vendor and has not been independently verified. 7. Feed Rate or Capacity The portable equipment can process 300 to 500 tons per hour (D16398Y. p. 3). 8. Material Handling and Pretreatment Needs The soil is sometimes screened to remove oversize debris (D16398Y). 9. Process Waste Streams.No available information. 10. Operator Requirements No available information. 11. Utility Requirements No available information. 12. Set-Up/Tear-Down Requirements CDE has transportable processing and soil handling equipment for use with this technology (D16398Y. p. 3).13. Technology Reliability/Maintainability No available information. 14. Public Acceptance No available information. 15. Information Sources D16398Y, Vendor literature D1 18770. Dickson, 1996

EPA/540/A5-91/009
January 1993

Pilot-Scale Demonstration of a Slurry-Phase Biological Reactor for Creosote-Contaminated Soil

Applications Analysis Report

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Office of Research and Development
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Cincinnati, Ohio 45268

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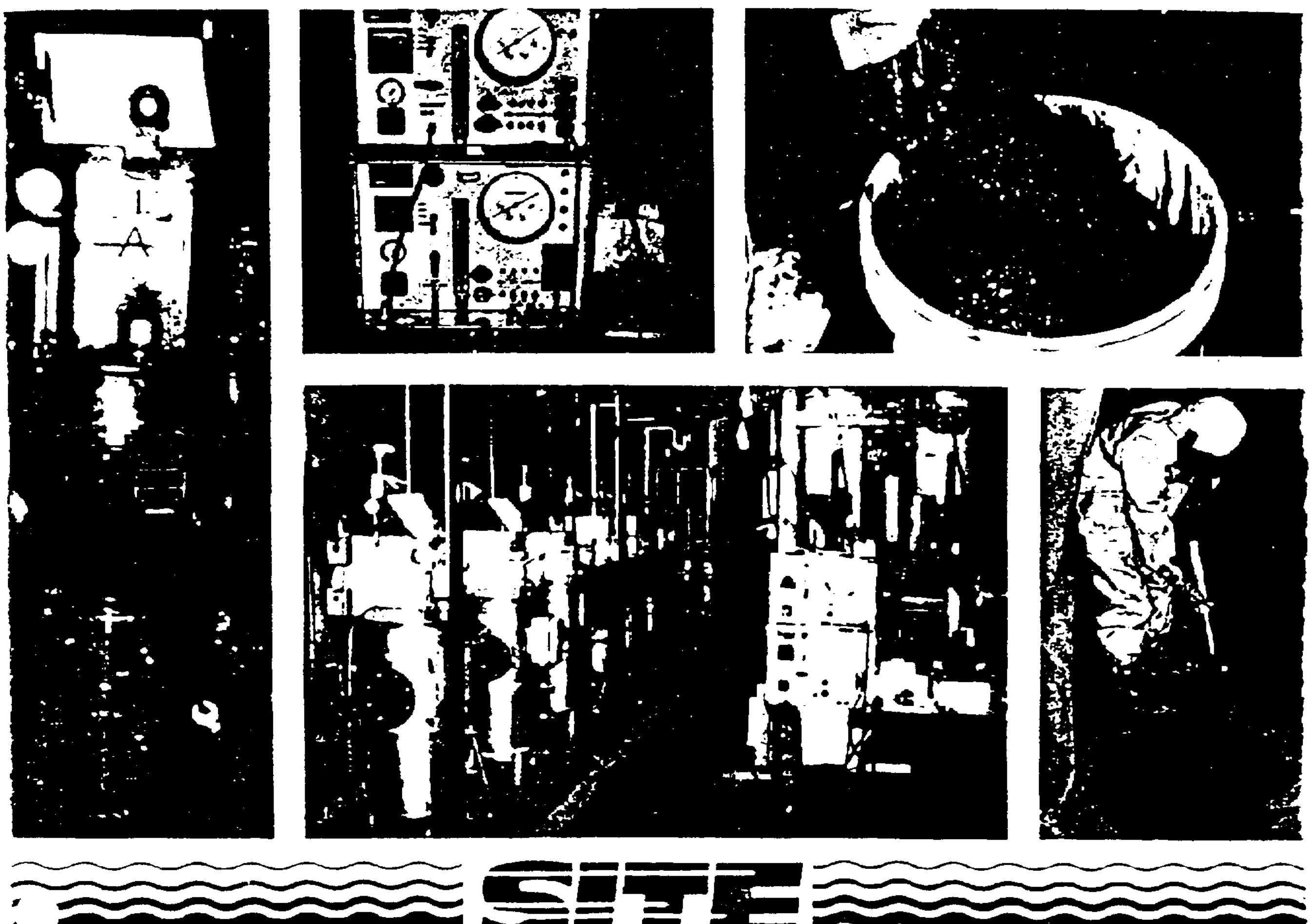
EPA

Pilot-Scale Demonstration of a Slurry-Phase Biological Reactor for Creosote-Contaminated Soil

Applications Analysis Report



SITE
SUPERFUND INNOVATIVE
TECHNOLOGY EVALUATION

Section 1
Executive Summary

Introduction

IT Corporation (17) in conjunction with ECOVA Corporation (ECOVA) evaluated ECOVA's slurry-phase bioremediation technology under U.S. Environmental Protection Agency's (EPA) Superfund Innovative Technology Evaluation (SITE) program. The technology demonstration was conducted at EPA's Test and Evaluation (T&E) Facility in Cincinnati, OH, from May 8 through July 31, 1991.

In this process, the soil is suspended in water to obtain a pumpable slurry, then pumped into a 64-L, continuously stirred tank reactor (CSTR). The CSTR can be supplemented with air, nutrients, or as was the case in this demonstration, an inoculum of microorganisms to enhance the biodegradation process. This treatment method has several advantages because an optimal environment for biodegradation of the organic contaminants can be maintained with a high degree of reliability. Biological reactions can proceed at accelerated rates in a slurry system because limiting nutrients can be supplied and contact between contaminants and microorganisms can be increased by effective mixing and maintenance of high bacterial populations.

The objectives of the technology demonstration were:

1. Evaluate the ability of slurry-phase bioreactor to degrade polynuclear aromatic hydrocarbons (PAHs) present in creosote-contaminated soil from the Burlington Northern (BN) Superfund site in Brainerd, MN.

2. Evaluate the performance of the slurry-phase bioreactor process, its removal efficiencies for PAHs. and the overall effect on soil toxicity.

3. Determine the air emissions resulting from the volatilization of the reactor contents during treatment.

4. Provide technical dam to assist EPA in establishing best demonstrated available technology (BDAT) standards for the level of treatment required before land disposal.

5. Develop information on capital and operating costs for the full-scale treatment system.

The purpose of this report is to present information from the SITE demonstration and from three case studies to evaluate the technical and economic applicability of slurry-phase bioremediation technology to the remediation of soil- and sludge-bound hazardous contaminants. Section 2 of this report presents an overview of the SITE program. Section 3 discusses information relevant to the technology's application, including site characteristics, waste characteristics, operation and maintenance requirements, materials handling requirements, personnel requirements, potential community exposures, and potentially applicable environmental regulations. Section 4 summarizes the costs associated with implementing the technology. Appendices A through C include: a description of treatment technology, SITE demonstration results, and three case studies.

Overview of the SITE Demonstration

The slurry-phase demonstration technology was developed and tested by ECOVA Corporation at the bench-scale level at ECOVA's laboratories in Redmond, WA. IT, working with ECOVA, developed materials handling and scaleup parameters during the pilot-scale SITE demonstration.

Five 64-L (working volume) EIMCO Biolift™ reactors, operated in batch mode, were used to test the degradation of soil-bound PAHs in a biologically active soil slurry.

Creosote-contaminated soil from the BN site was passed through a 1/2-in. screen to remove oversized material. After screening, the soil was mixed with water to form a 30% slurry. The slurry was then poured into a ball mill, milled to reduce the particle size, and screened on exit from the ball mill through a No. 8 sieve to produce a slurry with a grain size distribution suitable for charging EIMCO Biolift™ reactors. Following milling, 66 L of the soil slurry was transferred into each of the five reactors.

After the reactors were charged with the soil slurry, a concentrated inoculum of indigenous bacteria was added to each of the reactors. For optimal microbial activity, nutrient amendments, including ammonia, phosphate, magnesium, calcium, iron, and ammonium molybdate, were added to the reactors.

Sampling and analysis activities performed during the pilot-scale demonstration involved collecting composite samples from each of the reactors for pre- and posttreatment analyses and sampling throughout the demonstration to monitor system operation. During the demonstration, soil-bound and liquid-phase PAHs, total petroleum hydrocarbons (TPHs), nutrients, pH, dissolved oxygen (DO), temperature, toxicity, microbial phenotypes, and microbial activity were monitored. Composite samples were collected from three sampling ports located along the side of each reactor at different vertical locations. Soil-slurry samples were taken from the reactors over a 12-wk period. In the ninth week of operation, four of the bioreactors were reinoculated with an additional 125 mL of the inoculum to stimulate the PAH degradation process.

Results of the SITE Demonstration

The pilot-scale demonstration achieved significantly reduced PAHs concentrations in the soil matrix. Results indicate that an average of greater than 87% of total PAHs were removed over all five operating reactors after the 12th week of the demonstration period. Air samples taken continuously during the first 5 days and thereafter periodically through the ninth week of the demonstration show that volatilization of organics was initially significant. Semivolatile emissions peaked at 38.9 mg/m^3 on the first day of operation. By the fifth day of operation, volatilization of organic chemicals decreased to near or below detection limits. Microtox^{TM} analysis, performed over the course of the study to monitor toxicity levels of the slurried soil, showed that toxicity also decreased to low levels during slurry-phase biological treatment.

Results from the Case Studies

Information on the technology's performance at three additional hazardous waste sites was evaluated to provide additional performance data.

RETEC Corporation performed a 56-day, 1-million-gallon slurry-phase tank demonstration for a major Gulf Coast refinery. The concentration of most PAH species was reduced by greater than 90% in 56 days of treatment.

A Radian Corporation pilot-scale remediation study on petrochemical waste-contaminated soils and sludges at a Texas site employed four 10,000-L CSTRs. At HRTs of 17.5 and 42 days of treatment mom than 80% removal was observed for most compounds; removals of many compounds approached 100%.

The French Limited Task Group, Inc. (FLTG) has implemented in-situ, slurry-phase bioremediation at the French Limited Superfund site in Crosby, TX. Preliminary results indicate that constituents of interest are being reduced and that treatment objectives will be achieved if not exceeded.

Economics

Economic analysis of this technology is based on cost information provided by ECOVA and case study costs provided by RETEC and FLTG. (At the time of writing, cost information for die study performed by Radian was not available.) Conclusions of the economic analysis are:

- Costs am site-specific.
- Costs range typically from \$50 to \$250/yd^3.
- Labor costs associated with materials handling and operation can account for More than half of the cost incurred.

Conclusions

Slurry-phase bioremediation technology may be broadly applicable for treating soils and sludges contaminated with organic, biodegradable hazardous wastes, and it is a cost-effective alternative to cumbersome and often less-effective treatment methods. Advantages include onsite treatment and, in some cases, in-situ treatment, thus minimizing materials handling activities. Also, slurry-phase bioremediation can be implemented on sites with complex mixtures of organic wastes. The cost of stuffy-phase implementation ranges from about \$50 to \$250/yd^3; the cost depends largely on site/waste characteristics and remediation goals. Because the rate of recalcitrant organics biodegraded in the slurry-phase technology is largely unknown, future studies should include the fate of degradation products and toxicological evaluation of bioremediated soils and sludges.

Appendix B
SITE Demonstration Results

Introduction

IT Corporation in conjunction with ECOVA Corporation evaluated ECOVA's slurry-phase bioremediation technology under U.S.EPA's SITE program. The technology demonstration was conducted at the EPA's T&E Facility in Cincinnati, OH, during May through July, 1991. In this 12-wk study, creosote-contaminated soil from the BN Superfund site in Brainerd, MN, was used to test the slurry-phase process. This appendix briefly describes the BN Superfund site and summarizes the SITE demonstration activities and demonstration results.

Site Description

The BN Superfund Site is located on the border between Baxter and Brainerd, MN. State Highway 371 is approximately 800 to 1000 ft north of the site, and the Mississippi River flows about 3000 ft east of the plant. Residential areas are located within 1000 feet to the northeast and southeast of the site. BN has owned and operated the railroad tie treatment plant on this site since 1907. The plant uses creosote mixtures to preserve railroad ties. During the 1950s, BN began blending creosote with No. 5 fuel oil in a 1:1 ratio. At some undetermined time, this mixture was changed to creosote and coal tar, which are currently being used at the plant in the ratio of 7:3.

Historically, wastewater generated from the wood-treating process was sent to shallow, unlined surface impound-ments for disposal. The first impoundment, which covered an area of approximately 60,000 $ft,^2$ eventually became filled with sludge, and in the 1930s, it was buried under clean fill. A second, newer impoundment was used until October 1982, when a wastewater pretreatment plant was completed. The discharge of wastewater to the disposal ponds generated a sludge and leachate that contaminated both the soil and groundwater beneath both ponds. As a result, the site was included on the proposed National Priorities List issued by the EPA in December 1982. Figure B-1 is a map of the BN Superfund Site.

The Record of Decision (ROD) for The BN Superfund Site was signed by the Regional Administrator on June 4, 1986. The ROD specifies that only visibly contaminated soils and sludges will be excavated from the site for onsite treatment. Visibly contaminated soil was characterized as being heavily stained, dark brown to black in color, visibly oily, and usually having a pronounced creosote odor. The second impoundment from which wastewater and creosote were removed contained an estimated 6000 yd^3 of contaminated soil and 1000 yd^3 of contaminated sludge. The first impoundment, which was closed in the 1930s, contained an additional 2500 yd^3 of contaminated soil. Together, the two impoundments contained an estimated 9500 yd^3 of contaminated material.

Waste Characteristics

Initial sampling showed the primary constituents of concern to be PAHs, heterocyclic compounds, and phenols. Concentrations of these contaminants ranged from 34,388 mg/kg total PAHs and heterocyclics and 16 mg/kg total phenols in the first impoundment to 134,044 mg/kg total PARs and heterocyclics and 130 mg/kg total phenols in the second impoundment. Groundwater monitoring results indicated that the groundwater contamination is restricted to a relatively small area downgradient from the site. All contaminated soils were excavated from the lagoon areas mid stored in a waste pile on a site just east of the existing lagoon area. The contaminated soil is a fine, sandy soil, of which 75% has a grain size between 0.1 and 0.4 mm in diameter. The soil has a relatively low moisture content (10%) and a heat value below 500 Btu/lb.

In November 1989, IT sent a sampling team to the BN site to excavate soil for treatability studies. Soil was removed to a depth of 2 to 6 ft and placed in 55-gal drums. The drummed soil from this original excavation was stored at the BN site for nearly one year. In October 1990, IT returned to the site to collect four pails of contaminated soil for the bioslurry demonstration. Prior to collection of the soil for the bioslurry demonstration, the soil from the drums was homogenized. Three drums of homogenized soil were shipped to the T&E facility in Cincinnati, OH, for use in the pilot-scale bioslurry demonstration.

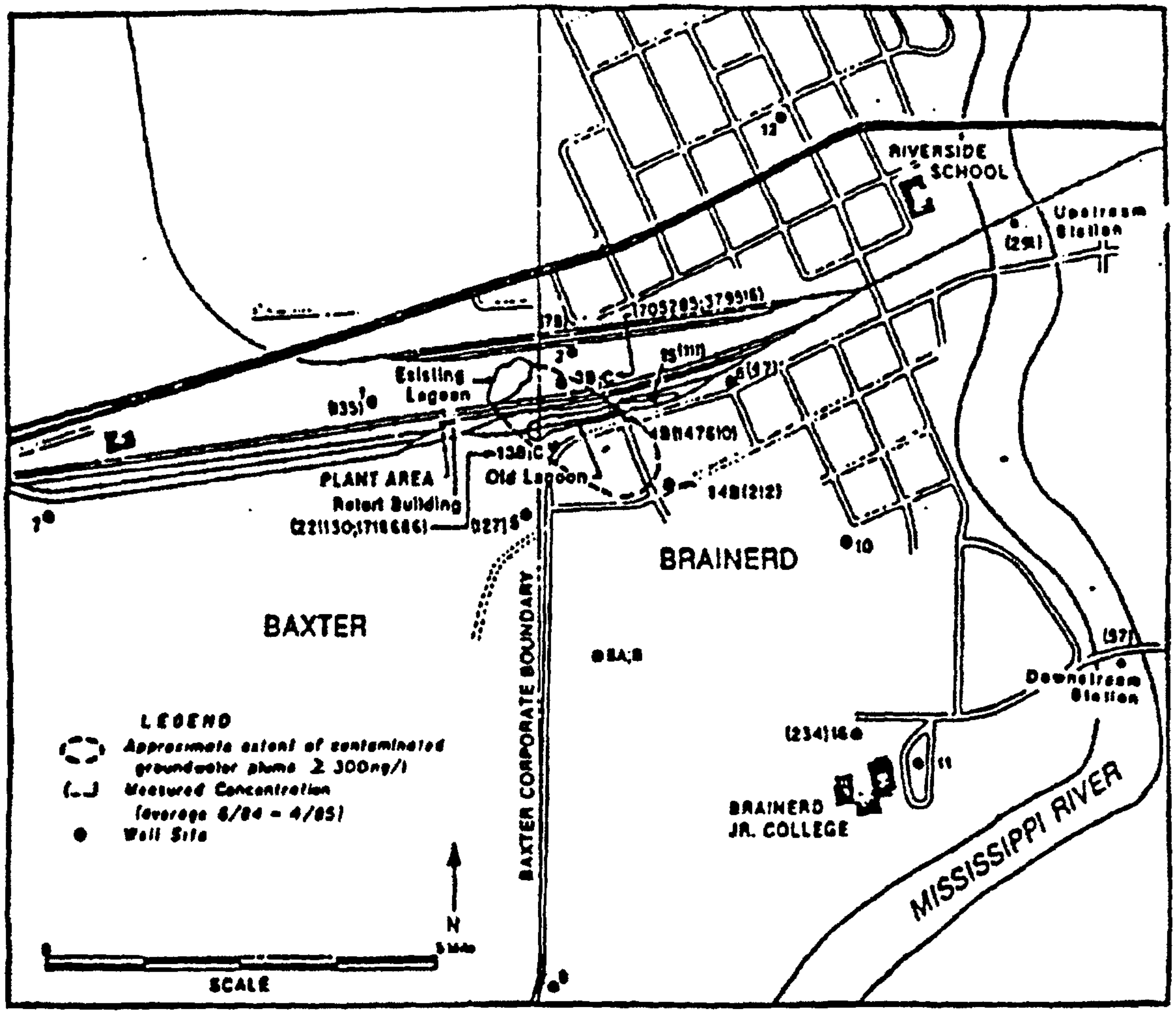


Figure B-1. Burlington Northern Superfund site, Brainerd, MN.
Source: Summary of Remedial Alternative Selection, Burlington Northern Hazardous West Site, Brainerd, MN. Environmental Protection Agency, Region V. 1985.

Process Description

The pilot-scale demonstration of slurry-phase bioremediation was performed from May 8 through July 31, 1991 at the EPA's T&E Facility in Cincinnati, OH. In this 12-wk study, creosote-contaminated soil from the BN Superfund Site in Brainerd, MN, was used to test the slurry-phase bioremediation process. During the demonstration, five 64-L EIMCO Biolift[3] reactors were used. Figure B-2 contains a photograph of the experimental setup.

The normal operational volume of the EIMCO Biolift™ reactor is 60 L. Because of the large volumes of slurry to be removed for analytical sampling at the initial time point, it was concluded that each reactor should initially be loaded to a volume of 66 L. This volume was immediately decreased after collecting the first sample set; this allowed for the maximum loading of the batch slurry reactor. Quantities of nutrients and inoculum added to each reactor at the start of the demonstradon were calculated on the basis of a 66-L initial reactor volume at 30% slurry.

Before initiating the pilot-scale slurry-phase demonstration, the soil was shoveled from a 55-gal drum (in which it had been transported from the BN site) and passed through a 1/2-in. screen to remove oversized material. As received, the soil was brown-to-black, fine-to-medium-grained sand with some minor gravel content, and somewhat resilient and greasy. Following initial screening, the soil was mixed with water to form a 30% slurry (W/V). The slurry was then poured into a

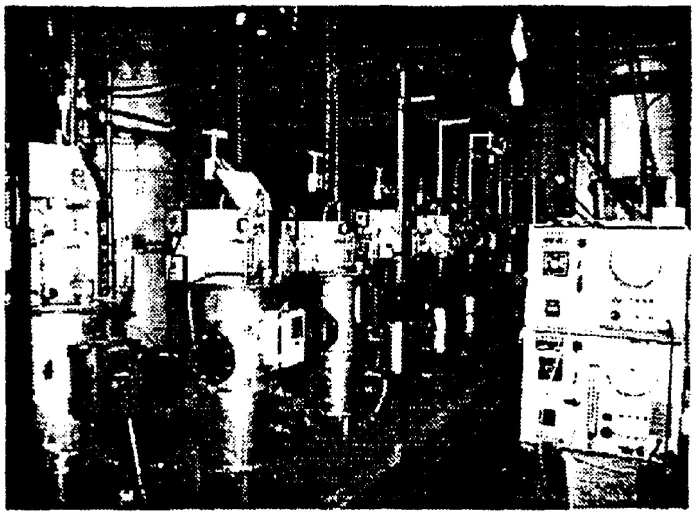


Figure B-2. Demonstration reactor setup.

ball mill to reduce the particle size and continuously screened with a No. 8 sieve at the outlet of the mill to produce a slurry with a grain size distribution suitable for charging to the EIMCO Biolift^{TM} reactors. Following milling, 66 L of the soil slurry was transferred into each of the five reactors.

After the reactors were charged with the soil slurry, 66 mL of a concentrated inoculum of indigenous bacteria (*Pseudomonas stutzeri*, *Pseudomonas fluorescens*, and *Pseudomonas stutzeri* strain FLN-1) was added to each of the reactors. Based on the titre of bacteria present in the inoculum, a total of 1.98×10^{12} colony forming units (CFU) was added per reactor. Furthermore, because the amount of free nitrogen, measured as ammonia nitrogen, needed for optimal microbial activity was quite low, ammonia supplementation was deemed necessary. Nutrient amendments added to the reactors included ammonia, phosphate, and trace amendments of magnesium, calcium, iron, and ammonium molybdate.

Sampling and analysis activities performed during the pilot-scale demonstration involved collection of composite samples from each of the reactors for pre- and posttreatment analyses and sampling throughout the demonstration to monitor system operation. During the demonstration, soil-bound and liquid-phase PAHs, TPHs. nutrients, pH, DO, temperature, toxicity, and microbial populations were monitored. Composite samples were collected from the three sampling pons located along the side of each reactor at three different vertical locations. All parameters of the demonstration were monitored in accordance with the sampling and analysis plan prepared for the project. Soil-slurry samples were taken from the reactors over a 12-wk period. In the ninth week of operation, four of the bioreactors were reinculated with an additional 125 mL of the inoculum to stimulate the PAH degradation process. Results of the demonstration are summarized below.

Results of Pretreatment and Posttreatment Soil Samples Analyzed by GC/MS Method

The pre- and posttreatment soil and liquid samples were analyzed for critical contaminants (PAHs) and TPH. The air samples were analyzed for volatile and semivolatile organics and total hydrocarbons (THCs). All the PAH analyses on soil and liquid samples were performed by the EPA-approved GC/MS method (SW-846, Method 8270[3]).

The pretreatment samples were collected at the start of testing (Week T_o) to determine the baseline concentration of the critical semivolatile contaminants in the soil treatment. The posttreatment samples were collected 9 weeks (T_9) and 12 weeks (T_{12}) after the start of testing to determine the levels of the critical contaminants remaining in the soil after treatment.

The concentrations of the PAH contaminants in the pretreatment soil samples ranged from 5.5 to 840 mg/kg. The concentrations of total, 2- and 3-ring, and 4- through 6-ring PAH level and the degradation rates determined by GC/MS are given in Tables B-1 and B-2. The concentrations of the PAHs in posttreatment samples indicated a significant re-

Table B-1. Concentrations of Total, 2- and 3-ring, and 4 through 6-Ring PAH Levels in Soil Samples, Determined by GC/MS, mg/kg

	Week		
Reactor	0	9	12
2- and 3-Ring PAHs			
Reactor 1	2299	<31.4	<49.5
Reactor 2	1418	5.5	<23.8
Reactor 4	390.5	<32.3	8.1
Reactor 5	2644	31.5	<46.3
Reactor 6	718.6	18	<44.7
Total	1494.0	<23.7	<34.5
4- through 6-Ring PAHs			
Reactor 1	1410	<273.7	316.4
Reactor 2	775	<65.2	<267.5
Reactor 4	288	<357.9	<91.3
Reactor 5	1836	<308.9	404.6.
Reactor 6	502	182.3	<291.8
Total	962.2	<237.6	274.3
Total PAHs			
Reactor 1	3709	<305.1	<365.9
Reactor 2	2193	<70.7	<291.3
Reactor 4	678.5	<390.2	<99.4
Reactor 5	4480	<340.4	<450.9
Reactor 6	1220.6	200.3	<336.5
Total	2456.2	<261.3	308.8

Table 8-2. Percent Degradation of Total, 2- and 3-ring, and 4- through 6-Ring PAH Levels in Soil Samples, Determined by GC/MS

	week	
Reactor	9	12
2- and 3-Ring PAH Degradation Rate		
Reactor 1	<98.63	<97.85
Reactor 2	99.61	<98.32
Reactor 4	<91.73	97.93
Reactor 5	98.81	<98.25
Reactor 6	97.50	<93.78
Mean Percent	>98.41	>97.69
4-through 6-Ring PAH Degradation Rate		
Reactor 1	>80.59	77.56
Reactor 2	>91.59	>65.48
Ractor 4	>-24.3	>68.30
Reactor 5	>83.18	77.96
Reactor 6	63.69	>41.87
Mean Percent	>75.31	>71.49
Total PAH Degradation Rate		
Reactor 1	>91.77	>90.10
Reactor 2	>96.77	>86.72
Reactor 4	>42.50	>85.35
Reactor 5	>92.40	>89.94
Reactor 6	>83.59	>72.43
Mean Percent	>89.36	>87.43

duction of PAHs in the soil matrix. The percent reduction of total PAH for Week T_{12} samples for the five reactors ranged from >72% to >90%. Results indicate that an average of >87% of total PAHs were degraded over all five operating reactors after the 12th week of the demonstration period.

Initial levels of the hazardous component of creosote PAHs were 2460 mg/kg, as determined by GC/MS. After twelve weeks of treatment, the concentration of the easily-degraded 2- and 3-ring compounds had declined by >98% from 1490 mg/kg to <35 mg/kg. The concentration of the much more intractable 4-, 5- and 6-ring compounds declined >72% from 960 mg/kg to <270 mg/kg.

The more complete degradation of the lower molecular weight PAHS reflects, in part, the higher bioavailability of 2- and 3-ring PAHs than 4- through 6-ring PAHs. Four- and higher-ring PAHs are considerably less soluble than simpler-ring PAHs.

The degradation rates of the different PAHs varied appreciably during the course of the study and reflect changes in the reactor environments. After nine weeks of testing, Reactors 2 and 4 were inoculated with fresh bacterial populations, and Reactors 5 and 6 were both reinoculated and amended with the surfacant Tween 80. Reactor 1 was not amended in any way. Results from Week 12 indicate that additional spiking during week 9 did not assist in further degradation of the complex PAHs. On the contrary, the level of contamination due to the presence of the more complex PAHs was greater in week 12 than in week 9. The lower level of PAH contamination in Week 9 soil samples may have resulted from laboratory procedures. To extract PAHs, the analytical laboratory used a sonication method (EPA Method 3550) that calls for a 2-minute sonication period. This may not have been enough time for the entire soil sample to intimately contact the extraction solvents and may have led to some inconsistent results for higher ring PAHs.

IT monitored TPH by infrared spectroscopy analysis over the course of the study. The data for soil-bound TPH indicate that, as with the PAH data, variations occurred in TPH levels in the slurry (Table B-3). As with the PAHs, the greatest decline in TPH occurred in the first 2 wk of the study. A rise in the levels of TPH occurred at Week T_6, however, this is 2 wk after total PAHs rose in the slurries. This delay could reflect the actual production of TPH compounds as metabolic products of the biodegradation of the PAHs. It could also reflect a simple rise in extraction efficiency resulting from soil particle communication.

GC/MS Analytical Results of Pretreatment and Posttreatment Liquid samples

The concentrations of the PAH contaminants in the pretreatment liquid samples ranged from 0.006 to 18 mg/L The concentrations for the majority of PAHs in the posttreatment samples were below the established MDLs for the instruments. After 9 wk of treatment, only the more recalcitrant, complex PAHs remained in the liquid matrix. These contaminants ranged in concentration from 0.013 to 0.14 mg/L. Results from week 12 indicated a further reduction in liquid phase contaminants as the levels of PAHs in the soil were further diminished, and the MDLs for the contaminants from week 12 were lower than those for week 9.

Results of Pretreatment and Posttreatment Soil Samples Analyzed by High Performance Liquid Chromatography (HPLC) Method

In addition to IT's sampling and analyses, ECOVA performed PAH analysts on soil samples. IT analyzed samples from Weeks T_O, T_9, and T_{12}, for PAHs; ECOVA from Weeks T_0, T_1, T_2, T_3, T_4, T_6, $T_{9,}$, $T_{10,}$, T^{11},and T_{12}. The ECOVA Laboratory in Redmond employed HPLC (modified EPA SW-846, Method 8310) to analyze for PAHs.

The baseline soil (Week T^8) characterization showed that naphthalene, acenaphthene, and fluoranthene were the constituents present at the highest levels (range of 2170 ± 250 ppm), followed by fluorene and benzo(a)anthraccne (range

Table B-3. Concentrations of Total Petroleum Hydrocarbons (TPH) in Soil, mg/kg

	week						
Reactor	0	2	4	6	9	11	12
1	35000	7200	1800	3100	1800	1900	1700
2	17500	2600	1800	2300	3200	1700	1800
4	13000	2700	1600	2100	1800	1700	1900
5	16000	3600	2300	2900	1700	3700	2700
6	19500	2400	2400	3600	2200	4900	2700

of 960 ± 8 ppm). Total PAH levels in these soils were determined to be 10,970 ppm. The 2- and 3-ring PAHs constituted 5890 pprn of the total, and the 4- through 6-ring PAHs accounted for 5080 ppm.

The pAH degradation rates over all rive operating reactors during the 12-wk study are presented in Table B-4. As seen in Table B-4, after the initial 2 wk of slurry-phase treatment, 90% of the total PAHs were degraded. Degradation rates (mg/kg/wk) for 2- and 3-ring PAHs were somewhat higher at 2 wk (96%) than they were for 4- through 6-ring PAHs (83%). The final levels at Week T_{12} were 653.5 mg/ kg for total PAHs, 152.1 mg/kg for 2- and 3-ring PAHs, and 501.4 mg/kg for 4- through 6-ring PAHs.

Comparison of Analytical Results Obtained by GC/MS and HPLC Methods

The GC/MS results indicate total PAHs were degraded by more than 87% for all reactors during a 12-wk study. Degradation rates for 2- and 3-ring PAHs (over 98%) were much higher than they were for 4- through 6-ring PAHs (72%). These observations agreed in proportion (although not in absolute concentration) with those obtained in the ECOVA HPLC study. The HPLC results show 94% reduction of total PAHs, 97% reduction of 2- and 3-ring PAHS and 90% reduction of 4- through 6-ring PAHs. Figures B-3 and B-4 compare the total mean PAH concentration at Weeks T_o, T_9, and T_{12}, as determined by GC/MS and HPLC.

Results of Air Monitoring

Air monitoring of total hydrocarbons (THCs), semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs) were performed continuously for the first few days of the demonstration. The VOCs and SVOCs were monitored periodically through the 9th week. THC emissions data show high emissions the first two days of process operation, followed by a steady decline to baseline recordings by the fifth day of operation. The VOC volatilization was high the first two days of operation, decreasing to near analytical detection limits by the third day of operation. The SVOC emissions (naphthalene, 2-methynaphthalene, acenaphthylene, acenaphthene, dibenzofuran. fluorene, phenanthrene, and anthracene) were detectable during the first four days of sampling. Beginning the sixth day of operation very small quantities (at or below detection) of semivolatiles were found.

Table B-4.Percent Total, 2- and 3-Ring, and 4- through 6-Ring PAH Degradation Rates in Soil Samples Analyzed by HPLC[a].

	Week								
Reactor	1	2	3	4	6	9	10	11	12
2- and 3-Ring PAH									
Reactor 1	98.53	92.87	99.14	84.41	99.28	98.56	98.71	86.28	98.21
Reactor 2	84.25	97.39	99.10	95.98	96.54	98.11	98.82	92.00	98.45
Reactor 4	56.64	97.17	99.38	97.76	95.02	98.15	95.41	91.77	98.43
Reactor 5	81.82	95.52	97.74	90.43	98.16	97.74	91.54	97.87	93.36
Reactor 6	88.79	96.40	98.29	97.15	99.39	97.83	99.22	99.50	97.25
Mean Percent		96.14				98.06			97.42
4- through 6-Ring PAH									
Reactor 1	35.54	70.41	87.37	50.80	88.15	93.23	86.65	85.11	86.16
Reactor2	34.10	83.46	91.56	77.56	80.13	91.86	90.30	91.16	92.41
Reactor 4	-79.11	87.28	93.79	90.22	72.28	93.19	92.37	92.72	94.32
Reactor 5	28.65	80.83	83.36	60.76	64.95	83.65	86.64	80.54	82.34
Reactor 6	47.60	85.90	83.35	83.35	93.53	95.59	91.99	88.50	90.07
Mean Percent		82.89				92.22			90.13
Total PAH									
Reactor 1	61.86	82.86	93.89	69.42	94.31	96.18	93.33	85.76	92.83
Reactor 2	60.15	90.70	95.48	87.13	88.65	95.10	94.73	91.60	95.55
Reactor 4	-10.75	92.26	96.61	94.02	83.73	95.69	93.90	92.24	96.39
Reactor 5	56.72	88.58	90.95	76.43	82.48	91.09	89.23	89.69	88.16
Reactor 6	71.34	91.95	91.96	91.30	96.91	96.88	96.16	94.84	94.21
Mean Percent		90.00				95.35			94.04

[a]HPLC = High performance liquid chromatography.

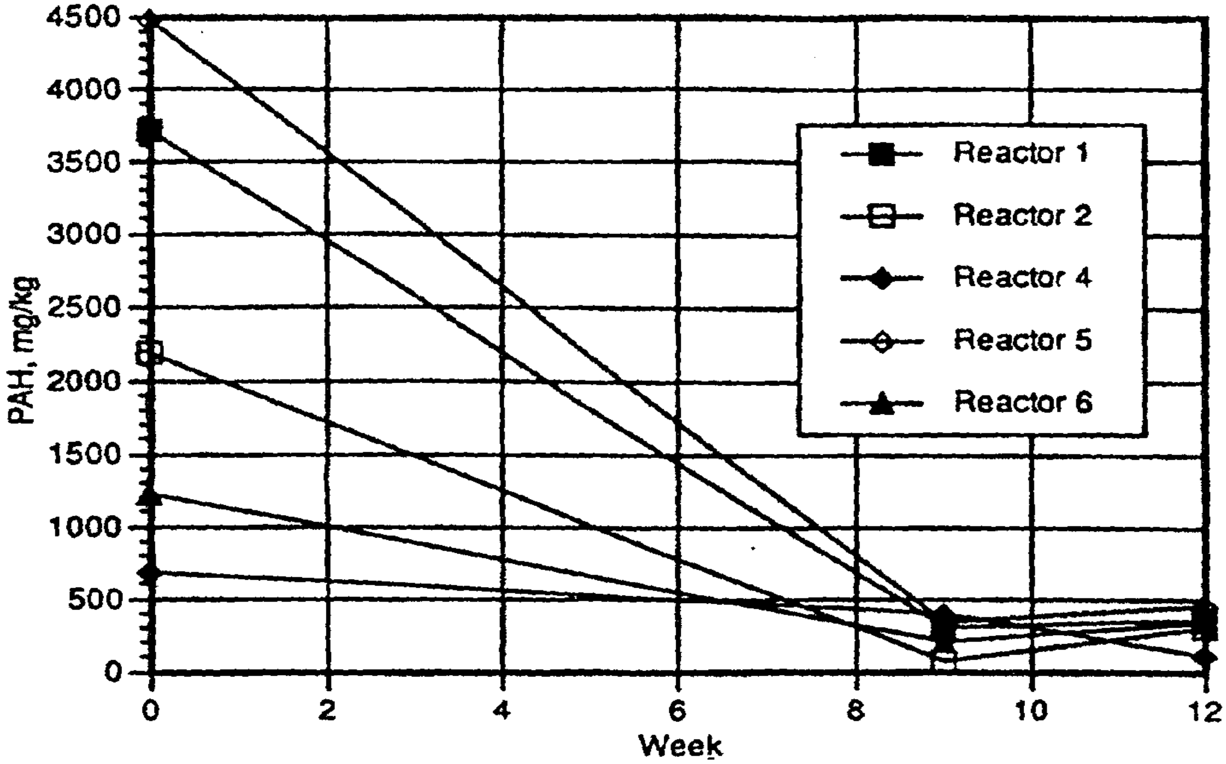


Figure B-3. Total PAH levels in reactor soil samples as determined by GC/MS.

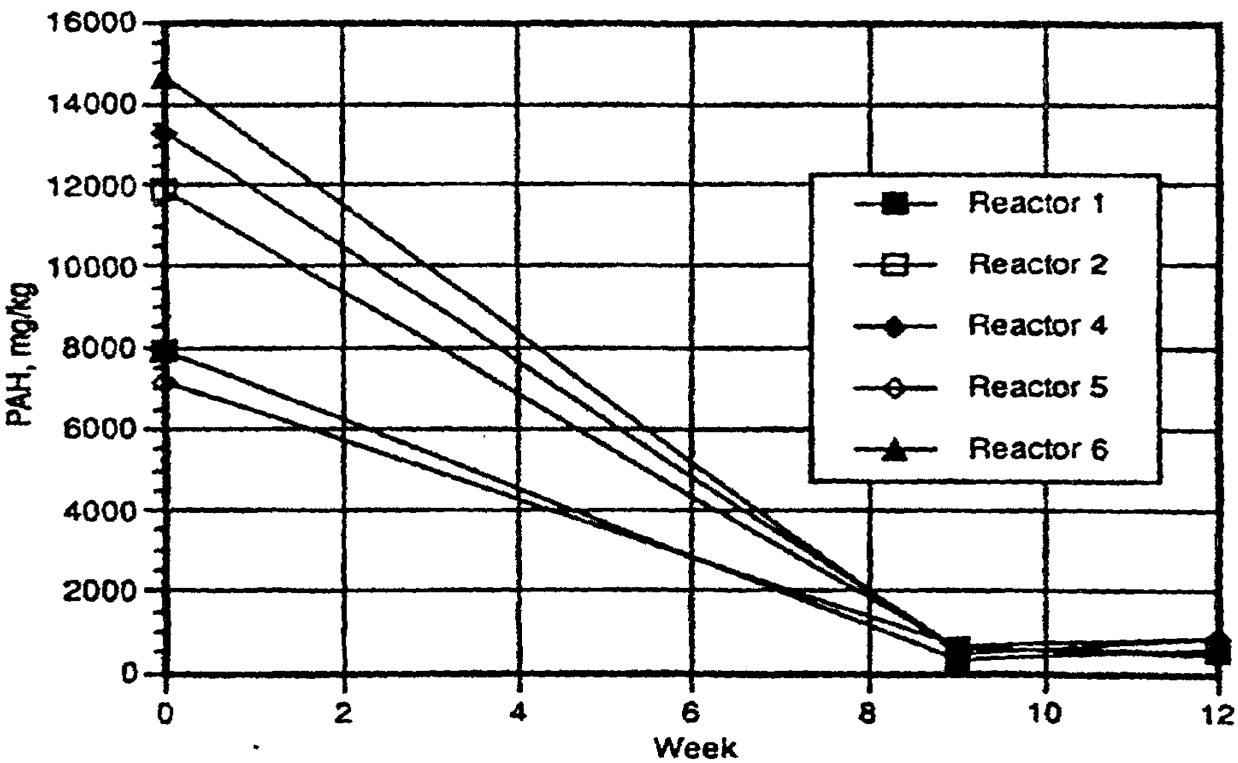
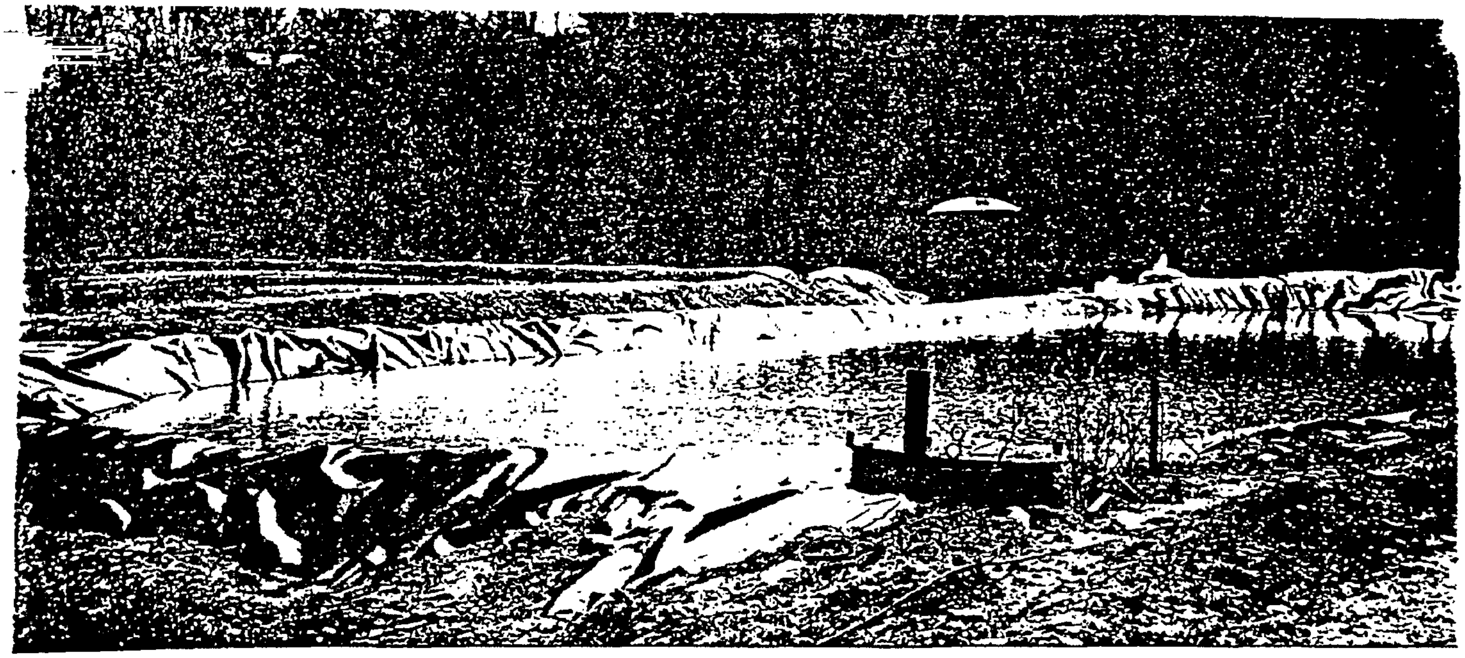
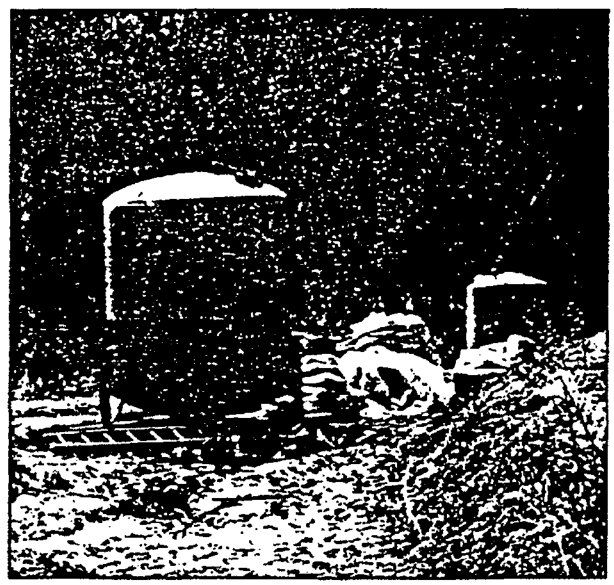


Figure B-4. Total PAH levels in reactor soil samples as determined by HPLC.



Above, water collected in the clay lined bioremediation cell is pumped to a lined storage pond for quality testing before disposal to the storm sewer. If required, the water is filtered through a bed of granular actived carbon, below, to remove PAH and TPH residuals and then passed to the clean water pond for final test before discharge.

Landfarming bioremediation is viable solution at Lake Erie MGP



By Brian P. Herner, Steven M. Goldberg, and Owen P. Ward, Ph.D.

More than 40,000 cubic meters of polycyclic aromatic hydrocarbons (PAHs) contaminated soil have been treated using landfarming bioremediation in a series of multiple lifts placed in a clay-lined biopad. The experience gained to date has enabled the development of a cost effective remedial process and a better understanding of the process through field monitoring and laboratory biofeasibility studies.

Background of the site

The Village of Port Stanley, Ontario, is located on the north shore of Lake Erie, about midway through the Great Lakes navigation system. From the 1920s to the 1950s, an oil gasification plant, producing a tar-like material as a byproduct, was operated about 1.5 km north of the shore. This oil tar was stored in on-site open pits which were filled in with dredged harbor sediment in 1970. The soil within the pit areas generally consisted of fine sand to clay-like material.

Continues on page 12→

Figure 1: Percent removal of PAHs in treated soil boxes after 90 days of treatment							
Treatment number	Initial PAH (mg/kg)	5 removal incl. naphth	% removal excel. Naphth	**Treatment number**	Initial PAH (mg/kg)	% removal incl. naphth	% removal excl. maphth
1	299	67	59	8	745	75	65
2	463	82	76	9	368	51	40
3	427	79	73	10	362	66	55
4	521	81	74	11	658	73	60
5	428	75	68	12	432	59	49
6	364	69	60	13	379	57	52
7	627	82	78	14	416	55	46

Lake Erie, from page 11

influenced by the near shore, lake bottom fill.

In the late 1980s, a voluntary cleanup program was initiated using landfarming bioremediation. Conestoga-Rovers and Associates (CRA), an environmental consulting engineering firm in Waterloo, Ontario, was retained by the site owner to provide engineering services, technical supervision, performance monitoring and compliance verification.

The site was originally estimated to contain about 40,000 cubic meters of PAH-contaminated soil. The concentration of PAHs was generally in the range of 800 to 1000 mg/kg. A permanent landfarming facility was constructed in 1988 and a pilot bioremediation study was conducted. Remediation criteria established under a Certificate of Approval specified that treated soil achieve a cleanup level of 200 mg/kg for PAHs with a specific level of 10 mg/kg for B(a)P.

Treatment at the site

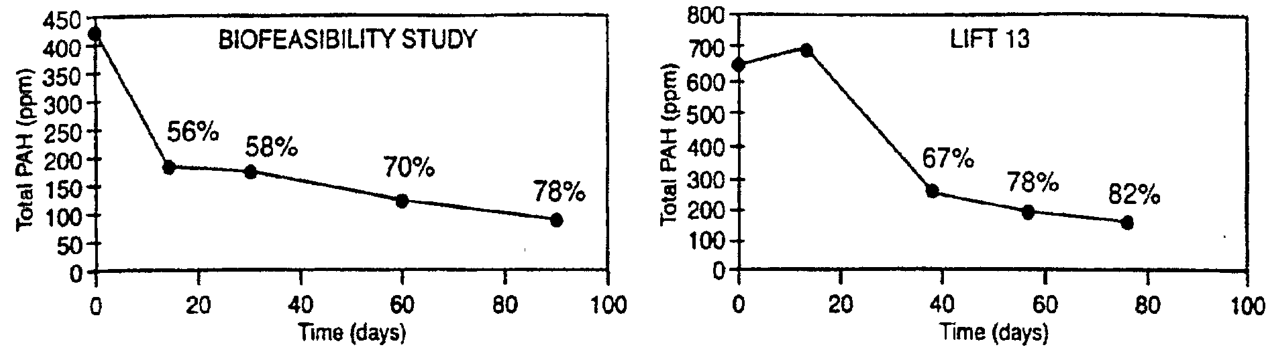
Early laboratory studies had indicated that the use of a specific aerobic bacteria amendment along with soil nutrification would provide accelerated biodegradation to achieve the remedial criteria.

The permanent treatment facility consists of a contaminated soil staging area, contaminated soil biological treatment area, or biopad, groundwater and runoff water storage pond, a water treatment facility and a clean water storage pond. The biopad facility is currently 150 by 60 meters and was constructed using three 15 cm lifts of clay compacted after each lift to provide a permeability of 10^{-7} cm/sec. The biopad was designed for multiple lift use and to hold about 4,000 to 5,000 cubic meters of soil per lift based on a depth of up to.5 meters.

The periphery of the biopad is bermed to contain and prevent runoff of surface water. During the initial phases of the project, fixed film bioreactors were used for treatment of contaminated water, but these have been replaced. Contaminated water is now treated through sand filtration and activated carbon and transferred to the clean water pond where it is tested before being discharged to a storm drain. Air

Brian P. Herner is vice president of Biorem Technologies Inc., Guelph, Ontario, Steven M. Goldberg is project engineer with Conestoga-Rovers & Assoc. Limited, Waterloo, Ontario. Owen P. Ward, Ph.D., is founder and technical director of Biorem Technologies.

Figure 2



monitoring is also conducted at the site during excavation and treatment periods to monitor for PAH and BTEX emissions.

Figure 3: Removal rates of PAH and B(a)P in Lift 13			
Days of sampling	Days of treatment on biopad	PAH concentration in mg/kg (% removed)	B(a)P concentration in mg/kg (% removed)
July 26, 1996	0	705	15.8
Aug. 15, 1996	20	213 (70%)	15.9 (nil)
Sept. 3, 1996	40	142 (80%)	13.5 (15%)
Sept. 26, 1996	63	112 (84%)	8.9 (44%)

Biofeasibility tests

Biorem Technologies Inc., Guelph, Ontario, began a three month soil box study using soil samples obtained in December 1994. The scope of the work included soil preparation and mixing to homogeneity, amendment of soil boxes with various combinations of treatment including abiotic control, variation of amendment frequencies, moisture maintenance and time course monitoring of PAH and bacteria levels in soil.

Fourteen treatment combinations were evaluated, including daily and monthly inoculum addition, daily and monthly nutrient addition, daily and monthly biosurfactant addition, daily and monthly inoculum and nutrient addition, daily and monthly inoculum and surfactant addition, daily and monthly nutrient and surfactant addition, biotic controls or no additives, and abiotic control or mercuric chloride poisoning.

Five kilograms of soil were used for each treatment combination. The average temperature maintained throughout the test was 25° C and the soil moisture was maintained at 14 percent for all treatments. Soils were tilled three to four times a week throughout the entire depth of the soil box.

Chemical analyses for PAHs were performed by Biorem using GC/FID. Confirmatory analyses were carried out by an independent certified laboratory for QA/QC using GC/MS analyses. Although no attempt was made to measure mineralization and volatilization, it is assumed that due to the volatile nature of naphthalene, it would be removed by volatilization in the soil box test. This was confirmed

Continues on page 14 →

Lake Erie, from page 13

by observing the naphthalene removal rates in the abiotic control compared to the unamended control. Figure 1, page 12, shows the percent removal of PAHs for each of the treatments after 90 days.

Significant findings of the biofeasibility study included:

- The highest amount of PAH reduction obtained in 90 days was in amended soils.
- The use of amendments yielded PAH reduction of more than 80 percent compared with less than 60 percent reduction for the unamended biotic control box.
- The best amendment systems were nutrient alone, inoculum alone or nutrient and inoculum together. The combination of nutrients and inoculum was not significantly better than either supplement alone.
- The monthly addition of amendments for the better performing treatments equaled or bettered a daily addition.

Microbial counts were monitored during the study and generally increased tenfold during the test period. The natural soils began with a count of 1 to 30 x 10^5 cfu/g and increased to 1 to 50 x 10^6 cfu/g. The bacteria counts in the soil associated with the daily inoculum treatments were not consistently higher than those associated with the monthly treatments.

Indigenous bacteria were as effective as external inoculum in the degradation of the PAHs. Biostimulation could be achieved through the use of nutrient amendment alone, with monthly addition being adequate. The use of surfactants was not contributory to more effective biodegradation of PAHs.

Implementation in the field

Full scale treatment of the soils using a modified regimen based on the biofeasibility test results began in Fall 1995 with Lift 11. The modified treatment consisted of discontinuation of the inoculum addition, monthly addition of nutrient based on analytical results and tilling twice a week. Soils applied in both Lift 11 and Lift 12 were taken from areas of the site with low level contamination. Nutrification followed by a short three week tilling regimen was sufficient to reach the site specific cleanup criteria.

Lift 13 provided the first opportunity to examine the performance of the modified treatment process and compare full-scale operation with the biofeasibility results. The lift was placed on the biopad on July 26, 1996, with an average starting PAH level of 705 mg/kg. The B(a)P level was reported to be 15.8 mg/kg, well above the criteria of 10 mg/kg. By Aug. 15, 1996, the PAH concentration had been reduced to about 213 mg/kg, a 70 percent reduction in 20 days. These results compared very favorably with the biofeasibility study as shown in Figure 2, page 13.

Lessons learned

- PAHs can be rapidly and economically biodegraded by landfarming making it a viable process for remediation of contaminated soils at MGP sites.
- Indigenous PAH degrading bacteria that can be stimulated to provide accelerated bioremediation will develop in contaminated soils.
- The use of a comprehensive biofeasibility study is mandatory to develope a cost-effective bioremediation program. The benefits of process improvement will provide short term payback.
- Specific high molecular weight, five and six ring PAH compounds such as B(a)P biodegrade significantly more slowly than the total PAH level in soil.
- Further process investigation and study of factors that accelerate the biodegradation of B(a)P and other five and six ring compounds will further enhance the use of bioremediation at MGP sites.

In contrast to the rapid reduction of the total PAH level, after 20 days of treatment the B(a)P level was virtually unchanged, exhibiting recalcitrant characteristics that had not been previously observed. On September 3, 40 days after the beginning of the lift, the B(a)P had still reduced only marginally, or about 10 percent, to 13.5 mg/kg while the PAHs were now well below the criteria at 142 mg/kg, a reduction of about 80 percent. See Figure 3, page 13.

It was suspected that the apparent slow degradation of B(a)P showed up in Lift 13 due to the relatively short time required for degradation of the total PAH and the high starting levels of B(a)P. An attempt was made to increase the tilling frequency of the soils, to improve bioavailability and accelerate the B(a)P degradation. This was nearly impossible, since September 1996 had 3.5 times the normal rainfall for the month. To address this, a backhoe was used to turn the soils over to improve oxygen availability and improve bioavailability of the B(a)P when the tilling equipment could not be used.

Other operating parameters of this lift were carefully reviewed, including nutrient addition frequency, oxygen content, pH and bacteria levels of the soil to ensure that no parameters were overlooked. Samples taken about three weeks later revealed B(a)P levels of 8.9 mg/kg, indicating a completed remediation cycle of 63 days. Since the higher molecular weight PAHs are more difficult to degrade, it was suspected that the B(a)P would degrade sequentially to the total PAHs, with compounds having a lower number of rings degrading first.

Recently at the site

Lift 14 was placed on the biopad in November 1996 and was tilled for two weeks before terminating operations for the winter. Treatment recommenced in Spring 1997. Initial samples collected on May 5, 1997, revealed PAH and B(a)P levels of 425 mg/kg and 16.1 mg/kg, Sampling completed during the summer months demonstrated that the PAH level again dropped below the 200 mg/kg criteria in about eight weeks with a PAH level of 140 mg/kg reported on July 17.

The B(a)P levels had decreased to 12 mg/kg and continued a slow decline to 11.8 mg/kg by August 13. In this instance, the slow degradation of B(a)P was causing a significant delay in completion of the lift and called for further investigation into the degradation characteristics of B(a)P.

B(a)P biodegradation characteristics

The slow biodegradation of 5 and 6 ring PAH compounds is generally conceded to be proportional to water solubility. B(a)P has one of the lowest solubilities of PAHs at .004 mg/l. In addition, it has been shown that B(a)P itself does not support the growth of aerobic bacteria and the biodegradation of B(a)P requires a cometabolic process in which enzymes produced by bacteria in the biodegradation of another chemical will break down the B(a)P to a form which is then directlv biodegradable. One such cometabolic substrate for the break down of B(a)P is another PAH, phenanthrene.

To examine possible influences on B(a)P reduction in the full-scale remediation program, degradation data taken from Lifts 13 and 14 were examined to determine if there was a relationship between the concentration of phenanthrene and the rate of degradation of B(a)P. No significant correlation was found and further investigation will be required to examine the applicability of this phenomenon to the site soils.

In spite of the prolonged treatment period required for B(a)P degradation, the cost for the treatment of the soils using the modified process has been significantly reduced. The current cost is in the range of $35 per cubic meter. The objectives of improved efficiency of PAH degradation have been achieved through design and implementation of a remedial process based on laboratory development. Further achievements can be realized with new techniques for the acceleration of B(a)P degradation. ›

Write in 719

BetzDearborn Bioremediation Technologies

Daramend™

Abstract

Daramend™ is an organic amendment-enhanced bioremediation technology designed to degrade organic compounds in industrial soils and sediments, either in situ or ex situ. This method is based on adding solid-phase organic soil amendments of specific particle size distribution and nutrient content. The organic soil amendments increase the rate of bioremediation by improving environmental conditions, including nutrient status, biologically available water, surfaces for microbial adhesion, and interfacial contact between the target compounds and microorganisms that degrade them.

The Daramend™ bioremediation technology is applicable for treating soils and dewatered sediments contaminated with heavy soils, chlorinated phenols, polynuclear aromatic hydrocarbons (PAHs) , phthalates, organochlorine pesticides, and nitroaromatics.

The Daramend™ amendments transiently bind contaminants, thereby reducing the acute toxicity of the media. This allows microorganisms to survive in soils containing very high concentrations of toxic contaminants. Previous studies have indicated that soils containing pentachlorophenol (PCP) concentrations greater than 300-400 milligrams per kilogram (mg/kg) may be to toxic for direct bioremediation, requiring preliminary treatments such as soil washing. Daramend™, however, has been shown in laboratory studies to be effective in soils with up to 2,170 mg/kg, with post- treatment concentrations as low as 0.7 mg/kg. Treatment time depends upon the soil characteristics and contaminant types and concentrations and can take from 90 days to over 200 days.

BetzDearborn Bioremediation Technologies (a division of W.R. Grace & Co.) has farther developed the Daramend™ technology for biodegradation of soils and sediments contaminated with chlorinated pesticides and nitroaromatics. This "second generation" Daramend ™ technology works by imposing, in cycles, oxic and anoxic conditions enhanced by proprietary soil amendments.

Ex situ remediation is generally done by landfarming. This involves placing the contaminated media in a treatment cell and regularly tilling it and monitoring water content. In situ is much the same, only there is no treatment cell.

BetzDearborn Bioremediation Technologies

Daramend™

Technology Description

1. Introduction

Daramend™ is an organic amendment-enhanced bioremediation technology designed to degrade organic compounds in industrial soils and sediments, either in situ or ex situ. This method is based on the addition of solid-phase organic soil amendments of specific particle size distribution and nutrient content. These amendments increase the ability of the soil matrix to supply water and nutrients to the microorganisms that degrade the hazardous compounds. Also, the amendments can transiently bind contaminants, thereby reducing the acute toxicity of the soil aqueous phase to the microorganisms. This allows microorganisms to survive in soils containing very high concentrations of toxic contaminants.

The Daramend™ bioremediation technology is applicable for treating soils and dewatered sediments contaminated with heavy oils, chlorinated phenols, polynuclear aromatic hydrocarbons (PAHs), phthalates, organochlorine pesticides, and nitroaromatics (D16985B, p.1).

2. History and Stage of Development

Previous studies have indicated that soils containing more than 300-400 milligrams per kilogram (mg/kg) pentachlorophenol (PCP) may be to toxic for direct bioremediation, requiring preliminary treatments such as soil washing. Daramend™ eliminates these pretreatment needs. Laboratory studies have proven Daramend™ to be effective in treating soils containing up to 2,170 mg/kg. Residual concentrations can be as low as 0.7 mg/kg PCP.

Developmental work on this technology began in 1988, and was completed in 1992. The development of Daramend™ was sponsored by the Government of Canada, who is also the owner of the technology. BetzDearborn Bioremediation Technologies (a division of W.R. Grace & Co.), from whom the technology is commercially available, has acquired the license for worldwide application of Daramend™ (D12294B, p.5). The technology has been demonstrated in pilot scale and full scale studies, and is commercially available (D11937J, D11946K). A "second generation" Daramend™ technology was also developed which can treat additional contaminants. It is used for the treatment of chlorinated pesticides and nitroaromatics. It was patented in the United States (U.S. Patent numbers 5,411,664 and 5,480,579) in May, 1995 and in January, 1996 (D16985B, p.2).

3. Process Description

The Daramend™ process is characterized by the use of solid-phase biodegradable organic amendments that have been prepared to a specific particle size range and nutrient profile. It also involves low-intensity tillage of the soil/sediment and maintenance of an optimal soil/sediment water content. The specific application rates and composition are considered by the developer to be proprietary information, though application rates typically range from 0.5% to 5% by weight (D169828, p.2).

The organic soil amendments increase the raw of bioremediation by improving environmental conditions (nutrient status, biologically available water, surfaces for microbial adhesion, and interfacial contact between the target compounds and microorganisms that degrade them)(D11946K). Also, the amendments can transiently bind contaminants, thereby reducing the acute toxicity of the soil's aqueous phase. This allows microorganisms to survive in soils containing very high concentrations of toxic compounds (D115151).

Ex situ applications involve the construction of a treatment cell to contain the contaminated media. This technique is often called landfarming. For in situ applications, the soil must be cleared and tilled to reduce soil compaction. After the soil has been pretreated (see the Material Handling and Pretreatment Needs section), the Daramend™ soil amendment is incorporated, usually at 1 to 5 % ratio by weight, followed by regular tilling and irrigating. The tilling reduces variation in soil properties and contaminant concentrations, while also incorporating the required amendments and helping to deliver oxygen to the contaminant-degrading microorganisms (D107131).

Equipment needed to implement the technology includes a rotary tiller, irrigation equipment, and excavation and screening equipment (D107131).

An irrigation system is used to maintain soil moisture in the desired range. Leachate or surface runoff caused by heavy precipitation is collected and reapplied to the soil as needed, but often a waterproof cover is constructed to avoid the need to collect runoff.

BetzDcarborn Bioremediation Technologies has further developed the Daramend™ technology for biodegradation of soils and sediments contaminated with chlorinated pesticides and nitroaromatics. This "second generation" Daramend™ technology works by imposing, in cycles, oxic and anoxic conditions enhanced by proprietary soil amendments (D16985B, p. 2).

4. Involvement with Government Programs/Regulatory Acceptance

The technology was accepted into the U.S. Environmental Protection Agency (EPA) Superfund Innovative Technology Evaluation (SITE) Demonstration Program in spring 193. The ex situ application of this technology was demonstrated from fall 1993 to summer 1994 at the Domtar Wood Preserving facility in Trenton, Ontario, Canada (D107131). The development of Daramend™ was sponsored by the Government of Canada, who is also the owner of the technology.

5. Performance

Daramend™ is designed to degrade chlorinated phenols, including PCP, creosotes, and petroleum hydrocarbons ,in industrial soils and sediments (D115151). According to the vendor, concentrations of PAHs and PCP have been effectively reduced from starting levels of about 25,000 mg/kg and 2,000 mg/kg, respectively. Concentrations of PCP and total carcinogenic PAHs are consistently reduced to less than 5 mg/kg and 50 mg/kg, respectively (D16985B, p.1). The time to remediate depends upon the concentration and type of contaminants. See Table 1, at the end of this section, for examples.

According to the vendor, feasibility studies have been conducted using the new Daramend™ technology on North American soils containing Metolachlor; 2,4-D and 2,4,5-T; and chlorinated pesticides (including DDT, DDD, DDE, dieldrin, toxaphene, and chlordane). In these studies, toxaphene concentrations were reduced 82% and DDT concentrations were reduced 25% in 151 days (3 anoxic/oxic cycles). In a separate test, TNT and amino concentrations were reduced 99.8% in 6 cycles over 113 days (D16985B, pp. 2, 4).

6. Limitations

Like many other bioremediation technologies, Daramend™ can be limited by low temperatures, which slow or stop biological activity. Other limiting factors include the structure, reactivity, and concentration(s) of the contaminants, their interactions with other compounds in the soil, and the physical, chemical, and biological characteristics of the soil (D13095A, p.30).

7. Feed Rate or Treatment Capacity

Treatment capacity is determined by the amount of space available for treatment.

8. Material Handling and Pretreatment Needs

The soil must be pretreated. In situ treatment involves breaking up the soils with excavation equipment to reduce compaction and aid in the removal of debris, such as rocks or metal. Ex situ treatment involves excavating and screening the contaminated soil. Sediments undergoing treatment must be dewatered. All media must be tilled with a rotary tiller to reduce the variation in soil properties and contaminant concentrations. Tiling depth is generally approximately 0.45 meter.

A treatability study must be performed to determine the most effective amendments. Water holding capacities are also assessed to determine optimum levels of water content. An irrigation system is installed to maintain this level (D11946K).

9. Process Waste Streams

If contaminated oversized debris is removed before the soil is treated, this material becomes the process waste stream.

10. Operator Requirements

Operators must be able to operate tilling devices and periodically monitor water concentration in the soil.

11. Utility Requirements

No available information.

12. Set-up Tear-down Requirements

For landfarming using this technology, a containment cell must be constructed. A liner is constructed to keep contaminants from leaching into the soil. An example site was constructed with two successive layers of sand and high-density polyethylene, and then a steel and polythylene cover was installed to prevent precipitation or evaporation from disrupting the required control of media water content. An irrigation system must be installed to maintain the optimum level of water content (D11937J).

No information was available on tear-down requirements.

13. Technology Reliability/Maintainability

Soil must be tilled regularly, approximately once every 2 weeks, and the treatment can take from 90 days to over 200 days. Soil moisture content must be monitored weekly, and moisture must be maintained within a specific range, determined by the water-holding capacity of the soil.

14. Public Acceptance

No available information.

15. Information Sources

D107131, EPA, SITE Technology Profile, 1995

D11494D, The Hazardous Waste Consultant, 1995

D115151, EPA, SITE Technology Profile, 1993

D11937J, Seech et al, 1993

D11946K, Seech et al, 1993

D16985B, Grace Dearborn, Inc., 1996

D169828, Grace Dearborn, Inc., 1994

Table 1. Results From Ex Situ Bioremediation Application [1]			
Contaminant	Initial Concentration (mg/kg)	Final Concentration (mg/kg)	Remediation Time (days)
Chrysene	170	2	207
DDT	680	1.9	147
Fluoranthene	410	2.9	207
PAHs[2]	659	106	295
Pentachlorophenol	2,170	11	280
Phthalates	4,350	26	130
Total Petroleum Hydrocarbon	8,700	34	182

Footnotes:

1 Source: The Hazardous Waste Consultant, 1995 (D11494D)

2 PAHs = polycyclic aromatic hydrocarbons

BetzDearborn Bioremediation Technologies

Dararnend™

Technology Cost

The cost of the Daramend™ process can range from $30 to $ 150 per ton ($27 to $140 per metric ton) and depends upon the type and amount of contaminants present, the soil type, and the cleanup levels required (D11494D). According to the vendor, the costs associated with second-generation Daramend™ treatment will be slightly higher - between $90 and $195 per ton depending on project specifics (D16985B, p.6).

Information Sources

D11494D, The Hazardous Waste Consultant, 1995

D16985B, Grace Dearborn, Inc., 1996

BetzDearborn Bioremediation Technologies

Daramend™

Case Study Overview

Daramend™ has been applied to over 50 soils with varying physical/chemical characteristics (D11513Z). Since 19
bioremediation technology has been used at 5 wood-preserving sites in Canada and the United States (D16985B, p

An ex situ application was conducted under the U.S. Environmental Protection Agency (EPA) Superfund Innovati
Evaluation (SITE) Demonstration Program at the Domtar Wood Preserving facility in Trenton, Ontario, Canada, ir
of 1993. Polycyclic aromatic hydrocarbon (PAH) concentrations were reduced by 94 % (1,170 milligrams per kilo
chlorophenols were reduced by 96 % (352 mg/kg to 13.6 mg/kg); and total petroleum hydrocarbons were reduced
achieved in 254 days, including days when no activity occurred due to freezing temperatures (D107131). Refer to
information.

Several successful pilot-scale demonstrations have been conducted at industrial sites. During one such demonstrati
was reduced 99.5%, from 7,000 mg/kg to 34 mg/kg in 182 days of treatment. 1,500 metric tons of this soil was lat
remediation, with similar results (D16984A, pp. 1, 3).

From 1992 to 1994, Grace Bioremediation Technologies (now BetzDearborn Bioremediation Technologies) performed a dem
metric tons of dewatered harbor sediments contaminated with PAHs and heavy metals. In 300 days of treatment, t
reduced from 1,000 mg/kg to 100 mg/kg, a 90% destruction efficiency (D169839, p.i)

A pilot-scale study was conducted on 100 metric tons of soil from a former wood treating facility. The PAH conce
approximately 700 to 86 mg/kg in 118 days, and to 5 mg/kg in 345 days. Cleanup levels for the site were achieved
hydrocarbons were also reduced, from greater than 6,000 mg/kg to less than 50 mg/kg (D11937J).

Information Sources

D107131, EPA. SITE Technology Profile, 1995

D11513Z, Marvan, Grace Dearborn, Inc., Web page

D11937J, Seech et al, 1993

D16985B, Grace Dearborn, Inc., 1996

D169839, Grace Dearborn, Inc., 1996

D16984A, Seech, O'Niell, and Marvan, date unknown

SteamTech, Inc. and Integrated Water Technologies, Inc.

In Situ Hydrous Pyrolysis/Oxidation (HPO)

Abstract

Hydrous pyrolysis/oxidation (HPO) is an in situ thermal remediation technology that uses hot, oxygenated ground water to mineralize organic compounds such as chlorinated solvents and refractoryhydrocarbons such as creosote. HPO works on the principle that in the presence of oxidants (oxygenated water or soil minerals), organic chlorinated compounds will readily oxidize to carbon dioxide and chlorine ions when heated to the boiling point of water. HPO is a rapid, in situ remediation technique that destroys subsurface contaminants, such as dense non-aqueous phase liquids (DNAPLs) and dissolved organic components, without the need for extraction.

HPO utilizes the technology of Dynamic Underground Stripping (DUS) to inject steam and oxygen into the subsurface. When injection stops, the steam condenses, and contaminated ground water returns to the heated zone. Chlorinated contaminants in the ground water mix with the oxygen and condensate and, with the presence of heat, rapidly oxidize into carbon dioxide and chloride. HPO is able to destroy the residual DNAPL components not readily removed by the DUS process. The in situ nature of the process reduces the overall cost of cleanup and decreases the cleanup time to months instead of decades.

HPO was developed by Lawrence Livermore National Laboratory (LLNL) and the University of California. It is currently licenced to SteamTech, Inc. and Integrated Water' Technologies, Inc. The technology has been commercially available since 1998.

According to the researchers, advantages of HPO include the following:

- Significantly increases reaction rates and decreases remediation time

- Increased mobilization of viscous contaminants

- Avoids problems of mixing common in other in situ oxidation processes

- Can be applied to large volumes

- Steam injection efficiently treats contaminants at depths of over 100 feet

- Economical alternative to excavation and pump-and-treat.

The primary limitation of HPO technology is the composition of the subsurface. HPO is most effective in sandy soils and does not work well in stratigraphies with interbedded clay layers, which impede steam flow.

SteamTech, Inc. and Integrated Water Technologies, Inc.

In Situ Hydrous Pyrolysis/Oxidation (HPO)

Technology Description

Introduction, History and Current Development, Process Description, Government Involvement, Performance, Limitations, Capacity, Material Handling, Waste Streams, Operator Requirements, Utilities, Set-Up/Tear-Down , Reliability/Maintainability, Public Acceptance, Information Sources

1. Introduction

Hydrous pyrolysis/oxidation (HPO) is an in situ thermal remediation technology that uses hot, oxygenated ground water to mineralize organic compounds such as chlorinated solvents and refractory hydrocarbons such as creosote (D18879I, pg. 1; D18877G, pg. 1). HPO works on the principle that in the presence of oxidants (oxygenated water or soil minerals), chlorinated organic compounds will readily oxidize to carbon dioxide and chlorine ions when heated to the boiling point of water.

Today, the principal treatment methods for chlorinated solvent- and PAH-contaminated soil are removal to landfills and incineration. HPO is a rapid, in situ remediation technique that destroys subsurface contaminants, such as dense non-aqueous phase liquids (DNAPLs) and dissolved organic compounds, without the need for extraction. This technique injects steam and oxygen below the water table, building a heated, oxygenated zone in the subsurface. The heat and oxygen accelerate the rate of remediation compared to in situ bioremediation.

HPO utilizes the technology of Dynamic Underground Stripping (DUS) to inject steam and oxygen into large volumes of subsurface. The DUS technology is discussed in detail in the RIMS library/database. HPO is able to destroy the residual DNAPL components not readily removed by the steam stripping alone. Target contaminants are chemically converted into benign compounds, without the need for additional surface treatment. The in situ nature of the process reduces the overall cost of cleanup and decreases the cleanup time to months instead of decades.

2. History and Stage of Development

HPO was developed by Lawrence Livermore National Laboratory (LLNL) and the University of California, Berkeley. It is currently licenced to SteamTech, Inc. and Integrated Water Technologies, Inc. (D18878H). The technology is based on Dynamic Underground Stripping (DUS) and utilizes the same technique of heating and steam injection. The technology has been commercially' available since 1998.

HPO was first demonstrated by LLNL and Southern California Edison Company in FY97 at the Visalia Commerci Creosote Site (Power Pole Preservation Facility) in Visalia, California. In one year, the process recovered 80,000 gallons of creosote. Due to the success, the operator selected this technology for full-scale remediation of the site (18878H).

In FY98, HPO was implemented at a non-Department of Energy (DOE) site in Visalia, California. Southern California Edison is using HPO to cleanup an aquitard 75 to 102 feet below the original site of the creosote DNAPL plume (D18878H; D18879I, p. 1).

FY99, HPO was deployed at the Portsmouth Gaseous Diffusion Plant X-701B site in Piketon, OH (D18878H).

3. Process Description

Hydrous pyrolysis/oxidation is used simultaneously with DUS. DUS is capable of providing fast removal of liquid, dissolved, and vapor phase contaminants. The technology uses steam to physically transport contaminants to the surface where they can be destroyed. A detailed discussion of DUS is included in the RIMS library/database. HPO is capable of destroying contaminants not readily removed by the DUS process. HPO is a thermally accelerated oxidation process which converts hazardous solvents to carbon dioxide, chloride ions, and water.

HPO processing eliminates the need for long-term treatment facilities by destroying the residual contaminant remaining after DUS and mobilizing other contaminants to facilitate destruction or removal. The technique is applicable to some dense non-aqueous phase liquids (DNAPLs) and dissolved organic compounds. This technology can be used when tritium is present as long as there is sufficient overburden to shield personnel. In addition, HPO may be able to treat radioactively-contaminated sites where ground water cannot be extracted (D17601M, p. 2).

Steam and oxygen are injected in parallel pipes, building a heated, oxygenated zone in the subsurface (D18431Q, p. 7). When injection stops, the steam condenses; thereby returning contaminated ground water to the heated zone. The contaminated water mixes with the condensate and oxygen to destroy dissolved contaminants and form products ranging from partially oxidized intermediates, such as phenols and benzoic acid, to fully oxidized carbon dioxide (D18879I, p. 1). The steam condensation step is essential because it facilitates mixing of the contaminant and the oxidant.

HPO improves the rate and efficiency of remediation by injecting steam and oxygen into the subsurface. The end result is that hazardous contaminants are converted into benign products. The rate of degradation depends on the thermodynamic properties of the contaminant (e.g., solubility, air-water partitioning constants, etc.) and the temperature of the subsurface. For example, at 90 degrees Celsius, trichloroethylene (TCE) degrades in a few weeks; however, at 120 degrees Celsius, degradation occurs in several hours (D18785D, p. 39).

According to the researchers, advantages of HPO include the following:

- Significantly increases reaction rates

- Decreases remediation time

- Most contaminants degraded in situ

- Increases mobilization of viscous contaminants

- Avoids problems of mixing common in other in situ oxidation processes

- Can be applied to large volumes

- Steam injection efficiently treats contaminants at depths of over 100 feet

- Economical alternative to excavation and pump-and-treat (D18878H; 17601M, p. 2; D175977).

4. Involvement with Government Programs / Regulatory Acceptance

This technology was first developed in 1992 through the U.S. DOE’s Subsurface Contaminants Focus Area (SCFA HPO is based on the DUS process which has undergone an independent post-demonstration sampling program conducted by the U.S. Environmental Protection Agency's (EPA) Superfund Innovative Technology Evaluation (SITE) program, and has been documented in the DOE Innovative Technology Summary (or “Green Book”). For a information on DUS, refer to the RIMS library/database.

5. Performance

Field testing has shown that HPO increases reaction rates, decreases reaction times, and is capable of degrading in contaminants such as creosote are mobilized into the treatment zone, making them more available for destruction technology can treat a plume in either the saturated or unsaturated zone.

LLNL has demonstrated complete mineralization of polycyclic aromatic hydrocarbons (PAHs), chlorinated solven components (D17602N, p. 2). In addition, trichloroethylene (TCE) and perchloroethylene (PCE) can be rapidly and benign products at moderate conditions, easily achieved in thermal remediation. PAHs have an even larger thermo oxidation, and are amenable to in situ destruction. Researchers claim that HPO can also be used to treat contamini and polychlorinated biphenyls (PCBs), that have been resistant to cleanup in the past.

In treatability studies using soil from the Visalia Pole Yard, DUS and HPO reduced the total hydrocarbon concentr milligram (mg) per kilogram (kg) to 39 mg/kg, representing a 99.4% reduction in hydrocarbon mass. In another tre soil, the total hydrocarbon concentration was reduced from 6870 mg/kg to 19 mg/kg. This represents a 99.7% redu These studies demonstrated a significant reduction of the following contaminants: naphthalene, 2-methylnaphthale fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo [a] anthracene, chrysene, and benzo (b and k] fluc

At the Southern California Edison site, the rate of removal was about 5,000 times faster than the rate of a pump-an

6. Limitations

The technology works best in stratigraphies with no interbedded clay layers to impede steam flow. Field tests have sandy soils. It is applicable at all DOE sites in unconsolidated sediments with 20 or more feet of overburden. Soil t of contaminant removal. Increased subsurface heterogeneity can have a detrimental impact on steam penetration (I

The technology is unable to remove metallic or medical waste (D18880B, p. 2).

7. Feed Rate or Treatment Capacity

After 10 months operation at the Visalia Commercial Creosote Site, HPO removed over 540,000 pounds (245 metr (D18884F, p. 3). The rate of removal will depend on many site-specific factors including subsurface concentration

8. Material Handling and Pretreatment Needs

This is an in situ process that does not involve material handling.

9. Process Waste Streams

The HPO process is expected to mineralize chlorinated organic compounds to benign products such as carbon diox on the contaminant, the waste stream may contain partially oxidized intermediates such as phenols, benzoic acid, a p. 2).

10. Operator Requirements

Operation of a steam injection system will require the boiler to be operated and manned continuously during the in

11. Utility Requirements

Steam generators require high quality feed water to avoid scale build-up in the generator. Steam injection wells mu and are often constructed of steel casing (D175977, p. 6).

12. Set-Up / Tear-Down Requirements

The placement of steam injection and extraction wells is critical to the efficiency of the remediation system (D175

13. Technology Reliability / Maintainability

No available information.

14. Public Acceptance

No available information.

15. Information Sources

D17601M, U.S. DOE

D17602N, SteamTech, Undated vendor web page

D175977, Davis, 1998

D188791, Leif et al., 1998

D18877G, U.S. DOE, 1998

D18878H, Technology Summary Sheet Preview, undated we page

D18431Q, Science and Technology Review, 1998

D18785D, U.S. EPA, 1998

D18880B, Gibbs, Undated

D120956, Udell et al., 1996

D18884F, U.S. DOE, 1998

SteamTech, Inc. and Integrated Water Technologies, Inc.

In Situ Hydrous Pyrolysis/Oxidation (HPO)

Technology Cost

Hydrous pyrolysis/oxidation (HPO) treatment is relatively simple and can be applied to large volumes of earth. Reheating soil to the boiling point by steam of $1.50/cubic yard makes it feasible to consider HPO as a potential large (D17601 M, p. 2).

HPO is an in situ process capable of treating both soil and ground water. In situ treatment can dramatically decrease surface treatment and reducing the costs of handling and disposal. Large-scale cleanup using HPO may cost as little (D18431Q, p.2).

Remediation costs are most affected by the subsurface geologic matrix and the depth, type, and quantity of contam

Information Sources

D17601M, U.S. DOE, Undated website

D175977, Davis, 1998

D18431Q, Science and Technology Review, 1998

StearnTech, Inc. and Integrated Water Technologies, Inc.

In Situ Hydrous Pyrolysis/Oxidation (HPO)

Case Study Overview

In FY97, In Situ Hydrous Pyrolysis/Oxidation (HPO) was demonstrated at the Lawrence Livermore National Lab Following the laboratory demonstration, there was a demonstration at the Visalia Commercial Creosote Site (powe The Visalia site was contaminated with a mixture of dense non-aqueous phase liquids (DNAPLs) and an oil-based and oxygen were injected into the subsurface and remediation was monitored from ground water monitoring wells, organic compounds (phenols, benzoic acid, fluorenone, and anthrone), decreased oxygen levels, and isotopic shifts indicators of oxidative destruction of creosote (D18879I, p. 1). For additional information, refer to Case Study 001

In January 1999, HPO was applied in coordination with DUS at the Portsmouth Gaseous Diffusion Plant (X-701B contamination at the Portsmouth site is the X-701B holding pond, an unlined 200 foot by 50 foot pond used for the waste water, solvent-contaminated solutions, and acidic waste water (D18877G). The site contains a small DNAPI polychlorinated biphenyl (PCB) contamination (D18884F, p. 14; D18883E). The total estimated funding is $2,320 data at this site are not yet available.

Information Sources

D18879I, Leif et al., 1998

D18877G, U.S. DOE, 1998

D18884F, U.S. DOE, 1998

D18883E, U.S. DOE, 1998

D189199, U.S. DOE, 1999

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In Situ Hydrothermal Oxidative Destruction of DNAPLS in a Creosote Contaminated Site

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K G. Knauss, and C. Eaker

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May 18-21, 1998

February 27, 1998

February 27, 1998

Lawrence Livermore National Laboratory

IN SITU HYDROTHERMAL OXIDATIVE DESTRUCTION OF DNAPLS IN A CREOSOTE CONTAMINATED SITE

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USA

ABSTRACT: Hydrous Pyrolysis / Oxidation (HPO) is an *in situ* thermal remediation technology that uses hot, oxygenated groundwater to completely mineralize a wide range of organic pollutants. A field demonstration of HPO was performed at a creosote contaminated site dining the summer of 1997. The groundwater was heated by steam injections and oxygen was added by coinjection of compressed air. The remediation was monitored from multiple groundwater monitoring wells. Dissolved organic carbon levels increased in response to steam injection as a result of the enhanced dissolution and mobilization of the creosote into the heated groundwater. Elevated concentrations of partially oxidized organic compounds (i.e. phenols, benzoic acid, fluorenone, anthrone and 9,10-anthracenedione), decreasedlevels of dissolved oxygen and isotopic shifts in the dissolved inorganic pool were indicators of partial to complete oxidative destruction of the creosote in the heated aquifer as a result of the HPO process.

INTRODUCTION

The 4.3 acre Southern California Edison Pole Yard located in Visalia, California was in operation for 80 years as a wood preservation treatment facility. As a result of this operation, this site has become contaminated with a DNAPL rnixture composed of pole-treating creosote and an oil-based carrier fluid containing pentachlorophenol. Placed on the EPA Superfund fist in 1977, pump and treat technology was deployed to reduce and contain the contaminant plume. Over a period of nearly 20 years an estimated 10,000 lbs. of contaminant were removed from the soil and groundwater.

In the summer of 1997 Southern California Edison began the application of two thermally enhanced remediation technologies to accelerate the clean-up. The first method, Dynamic Underground Stripping (DUS), involves steam injection coupled with vacuum extraction to enhance the mobilizationand removal of free product (Newmark and Aines, 1995). The second method, Hydrous Pyrolysis / Oxidation (HPO), is a novel *in situ* thermal remediation technology that uses hot, oxygenated groundwater to destroy organic contaminants by completely oxidizing the organic pollutants to carbon dioxide. The supplemental oxygen is delivered in the form of injected air. HPO is needed to destroy the residual DNAPL components not readily removed by the DUS process.

Initial laboratory-based feasibility experiments were conducted to investigate the HPO of actual DNAPL material with excess dissolved O_2 under conditions similar to those achievable during thermal remediation (Knauss et al., 1998; Leif et al., 1998). These experiments demonstrated that dissolved O_2, readily reacts with the compounds making up the DNAPL creosote mixture to form products ranging from partially oxidized intermediates, such as phenols and benzoic acid (Figure 1), to the fully oxidized product CO_2 (Figure 2).

Field implementation of HPO remediation at the Southern California Edison Pole Yard site was initiated in May, 1997 using 11 steam injection wells encircling the creosote DNAPL pool. An aquifer situated 75-102 ft. below ground surface was targeted for the HPO field demonstration.

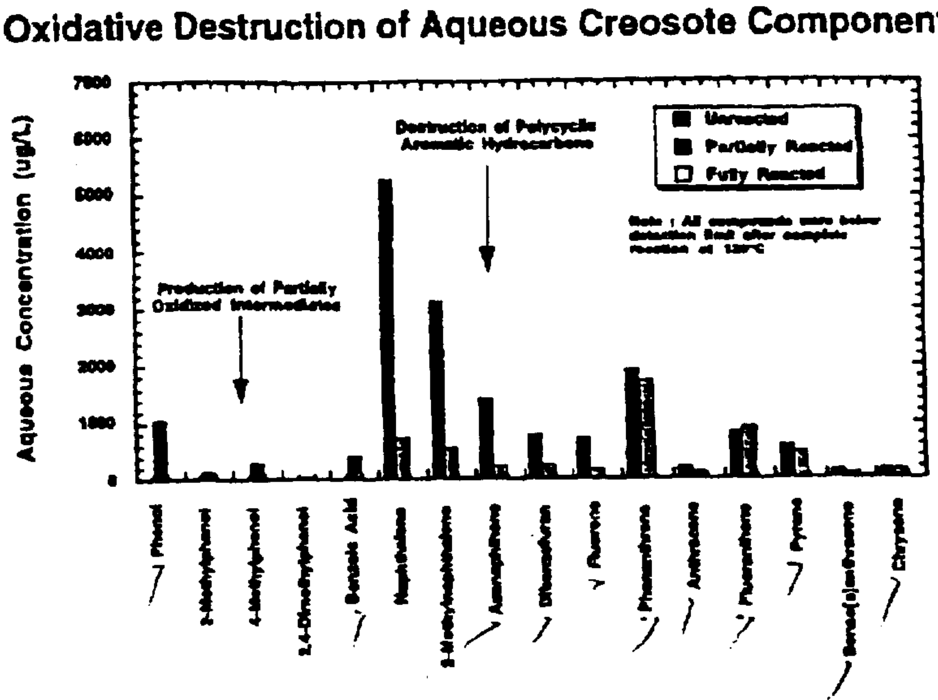
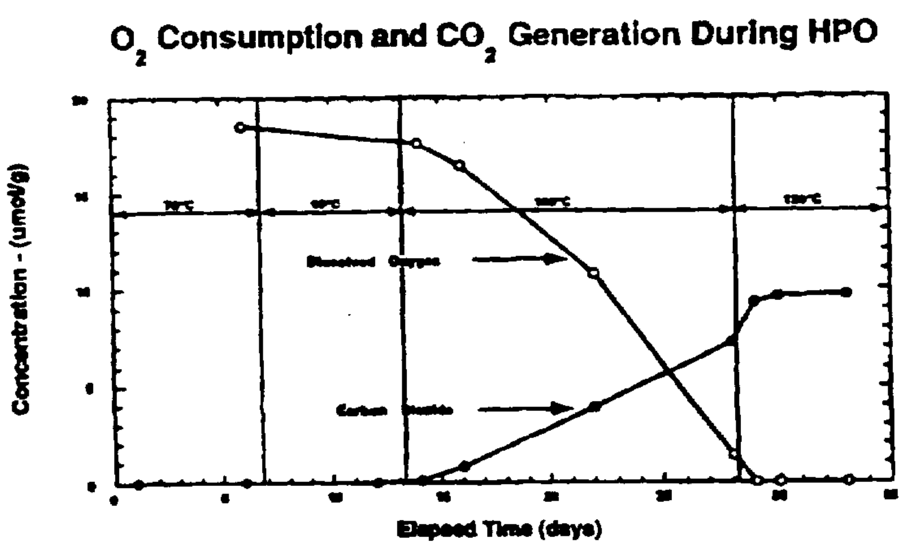


FIGURE 1. Histogram showing aqueous concentrations of organic compounds during a laboratory scale HPO experiment. Starting concentrations are shown in black and partially reacted are shown in gray. Complete destruction of creosote was achieved at 120°C.



ANALYTICAL METHODS

Priority pollutants were extracted and concentrated bysolid phase extraction (SPE) prior to analysis by gas chromatography - mass spectrometry (GC-MS). Typically a water sample ranging in volume from 1 to 4 liters was flowed by positive pressure through an SPE cartridge packed with 200 mg of ENV+ (International Sorbent Technology), a highly crosslinked styrene-divinylbenzeneresin suitable for extraction of nonpolar and polar compounds from water. After sample extraction, the SPE tubes were dried and eluted with 4.5 mL of a dichloromethane / isopropanol eluent (1:1). The extracts were spiked with a six component internal standard mix and volumes adjusted to 5 mL. Bottles were extracted with a dichloromethane / isopropanol solvent mix (1:1) to extract organic compounds adsorbed to the glass. The extracts were spiked with a six component internal standard mix and the volumes adjusted to 5 mL. GC-MS analyses of the SPE extracts were performed on a Hewlett-Packard 6890 gas chromatograph equipped with a 30 m x 0.25 mm i.d. HP-5ms (5% phenyl methylsiloxane) capillary column (0.25 µm film thickness) coupled to a Hewlett-Packard 6890 Series Mass Selective Detector operated in electron impact mode (70eV) over the mass range 35-450 dalton with a cycle time of 1.1 s. The GC oven temperature was programmed at isothermal for 2 min. at 50EC, ramped at 8EC/min. to 300EC, and isothermal for 6.75 min., with the injector at 250EC and helium as the carrier gas. The MS data were processed using Hewlett-Packard Chemstation software. Internal standard method, using a relative response factors, was used to quantitate the target compounds.

RESULTS AND DISCUSSION

The creosote-derived groundwatercontaminants present in die intermediate aquifer of the Southern California Edison Poleyard exhibited large variations in both compound distributions and contaminant amounts depending on when and where the water samples were taken. Observations consistent with the process of DUS were the increased concentrations of dissolved organic compounds following increases in groundwater temperature as a result of the steam injections. This is represented by die elevated levels in the aqueous concentrations polycyclic aromatic hydrocarbons (PAH) following the injections of steam (Figure 3). The relative abundances of the higher molecular weight PAH (i.e. fluoranthene, pyrene and chrysene) were also observed to increase as a result of the steam injections.

One result from the HPO process was the rise in the groundwater concentrations of partially oxidized organic compounds. These oxygenated compounds (i.e. low molecular weight phenols, benzoic acid, fluorenone, anthrone and 9,10-anthracenedione) represent the partially oxidized intermediates formed during the HPO of a complex creosote mixture. Fig. 3 shows how the concentrations of these oxygenates changed in response to the steam injections. The levels of total oxygenates maximized following both steaming events and their presence is consistent with the aqueous phase oxidations expected under these conditions.

The measurement of dissolved oxygen also aided in the evaluation of the HPO process. A knowledge of the dissolved oxygenlevel in the groundwater was critical during the application of HPO because the fundamental principle of HPO is the ability of hot, oxygenated water to completely mineralize organic compounds to carbon dioxide.The aqueous phase oxidation will occur as long as sufficient dissolved oxygen is present. Figure 4 is a plot of the dissolved oxygen measurements in the aquifer as a function of time during the field test. A steady decrease in the level of dissolved oxygen was observed during the field test and is consistent with the HPO chemistry where the dissolved oxygen is the oxidant during the chemical oxidation of the aqueous organic species.

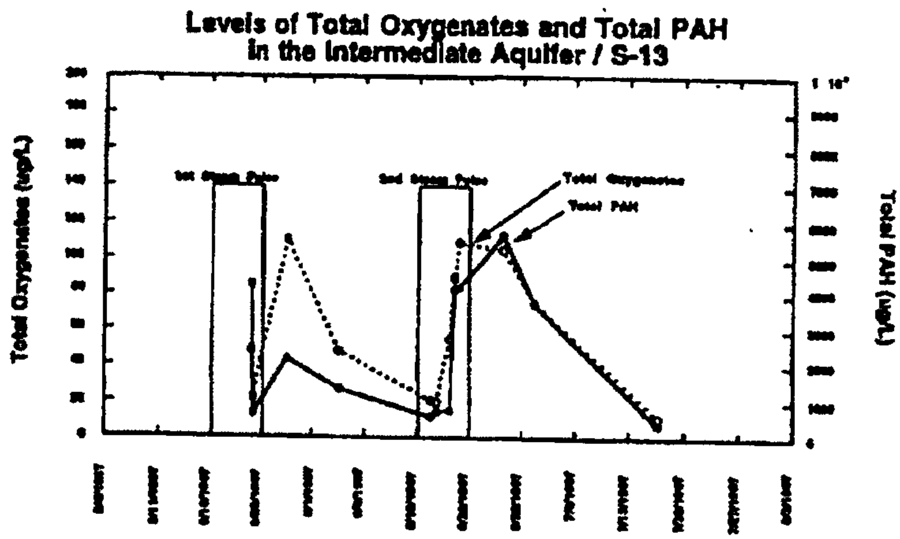


FIGURE 3. Concentrations of total oxygenates and total PAH (polycyclic aromatic hydrocarbons, EPA Method 8270C) in the aquifer during the HPO test period. Elevated PAH concentrations reflect enhanced mobilization due to DUS. Oxygenate increases are consistent with partial hydrocarbon oxidation by HPO.

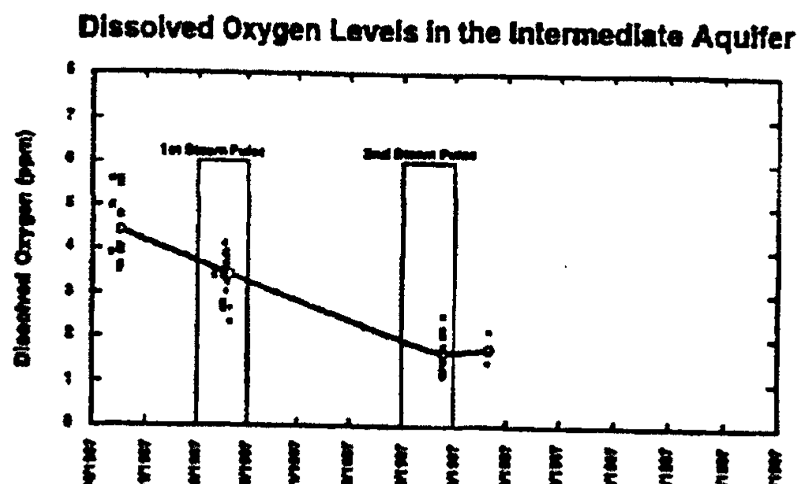


FIGURE 4. Concentration of dissolved oxygen as a function of time during the HPO demonstration. Average dissolved oxygen concentrations (open circles) were calculated using the combined values from three different analytical techniques. Dissolved oxygen levels dropped from 4.4 ppm to 1.7 ppm during the test period.

Another analytical tool used for evaluating the progress of the HPO remediation proem was the measurement of carbon isotope abundances (^{12}C, ^{13}C and ^{14}C) of the dissolved inorganic carbon. Because both $^{13}C/^{12}C$ and $^{14}C/^{12}C$ values of the creosote are distinct relative to the groundwater, these measurements were used to trace carbon derived from the oxidation of the creosote compounds. Figure 5 shows the variations in ^{14}C versus d^{13}C values of dissolved inorganic carbon in the groundwater. The groundwater end-member value was the isotopic signature prior to steaming. The dissolved inorganic carbon became "older" after steaming, consistent with the production of dissolved inorganic carbon by the oxidation of "dead" creosote carbon.

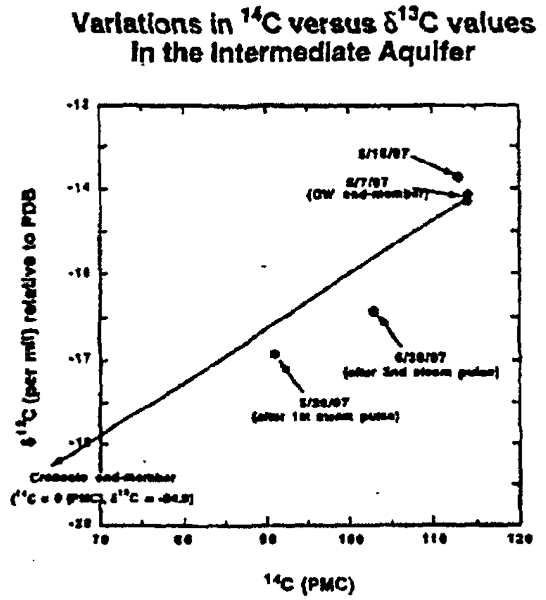


FIGURE 5. Variations in ^{14}C versus d ^{13}C values of dissolved Inorganic carbon (DIC) In groundwater. The groundwater end-member value was the isotopic signature p or to steaming. The DIC became "older" after steaming, consistent with the production of DIC by the oxidation of "dead" creosote carbon.

CONCLUSIONS

It is clear from the Visalia Field Test at the Southern California Edison Pole Yard that the combined applications of two *in situ* thermal remediation technologies, Dynamic Underground Stripping and Hydrous Pyrolysis / Oxidation, have greatly accelerated the remediation of this creosote-contaminated site. The application of DUS to the site accelerated the mobilization and removal of creosote. The application of HPO to the Southern California Edison Pole Yard has accelerated the site remediation by oxidizing creosote components. Observations consistent with the process of HPO were increases in groundwater oxygenate concentrations, decreases in dissolved oxygen levels and shifts in carbon isotope abundances in the inorganic carbon pool.

ACKNOWLEDGMENTS

The authors thank Allen Elsholz and Ben Johnson for field. We also thank the employees of Visalia Southern California Edison Co. and the employees of SteamTech Environmental Services for expert assistance at the site. This work was performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under Contract W-7405-Eng-48. Partial support provided by the Southern Califomia Edison Company was greatly appreciated.

REFERENCES

Knauss K. G., M. J. Dibley, R. N. Leif, D. A. Mew and R. D. Aines. 1998. "Aqueous oxidation of trichloroethylene (TCE) : A kinetic analysis." *Geochim. Cosmochim. Acta* (submitted).

Leif R. N., R. D. Aines and K. G. Knauss. 1998. *Hydrous Pyrolysis of Pole Treating Chemicals:* A) *Initial Measurement of Hydrous Pyrolysis Rates for Naphthalene and Pentachlorophenol;* B) *Solubility of Flourene at Temperatures up to* 150EC. Lawrence Livermore National Laboratory, Report.

Newmark R. L. and R. D. Aines. 1995. *Summary of the LLNL gasoline spill demonstration - Dynamic Underground Stripping Project*. Lawrence Livermore National Laboratory, UCRL-ID-120416.

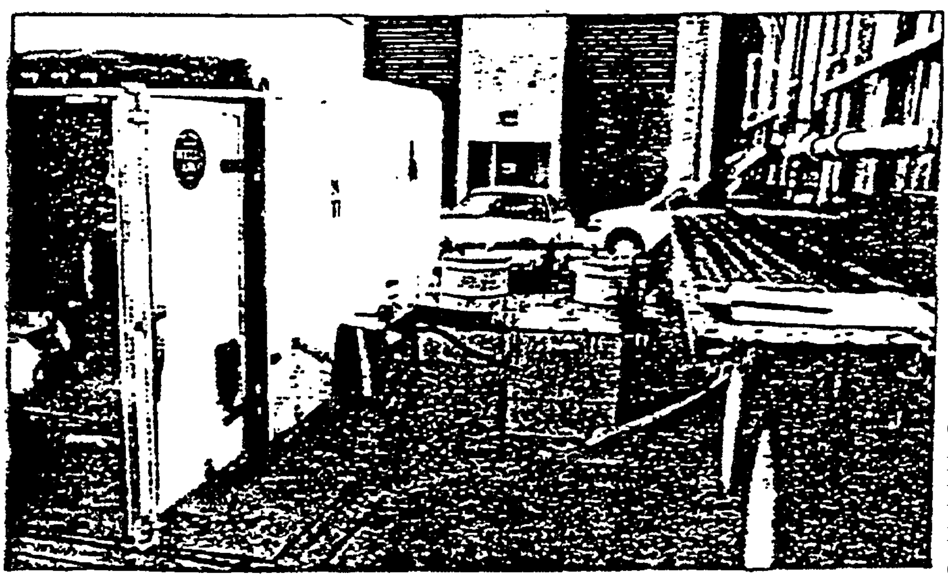
CaseHistory

Cleaning Soil With Steam Injection

Kenneth Meakles
Soil Remediation Technology, LLC

Searching for a soil remediation technology often leads to a lineup that includes many of the following: soil washing, low temperature thermal desorption, bioremediation and over excavation. The search also inevitably takes a turn to investigate the critical elements of cost, liability and efficiency.

Low temperature thermal desorption technology uses air, pressure, heat and/or mechanical agitation as the driving force for volatilizing Rad removing contaminants from soil into an air stream for further treatment. Separating contaminants from soil simplifies that final treat-ment of contaminants. Using soil washing techniques, contaminants are washed from the excavated soil into a chemical solvent. The liquid is treated to remove and destroy contaminants,and the solvent is reused. Biological treatment includes composting, in which contaminated materials is mixed with bulking agents (e.g. sawdust, wood chips) and placed in reactor vessels or piles. Aeration, temperature and nutrient levels are controlled to encourage microbial growth. Microorganisms then metabolize contaminants, breaking them down into less harmful materials.



Components of the steam injection and vapor extraction system: processing trailer (right), emissions control trailer (left), effluent tank (front) and two water processing carbon barrels (back).

Problem

A recent site closure in Pennington, N.J., required a soil remediaton solution for chlorinated hydrocarbons and aromatic solvents. The contamination, originating from a storage tank and drum storage pad, consisted of tetrachloroethylene, chlorobenzene, ethylbenzene and toluene in levels over 1,000 ppm. To keep the soils on site, 770 tons of contaminated material had to be cleaned to below 1 ppm, by permitt from the New Jersey Department of Environmental Protection (NJDEP).

Two technologies were considered for the project. The first was *over excavation*, a method that excavates all contaminated soil and disposes of it off-site, typically in a landfill or permitted thermal facility. The primary disadvantages to this method are cost and liability. The process, including transportation, disposal, excavation and back fill, cost about $295 per ton. It also creates liability for the generator—liability of transportation and future liability of an off-site facility over which the generator has little control.

Solution

The technology chosen for the project—led by Dan Raviv & Associates, Millburn, NJ, with work performed by Soil Remediation Technology, LLC, Bridgeton, NJ—used machines that performed steam injection and vapor extraction. The primary advantages to these machines, which have been used in ex-situ cleaning of soils containing petroleum hydrocarbons since 1989, include a small foot print (30-by-40 feet), minimal noise, product recovery and cost efficiency. Air permits are also easily obtained.

Under permit from NJDEP, the soil was excavated and stockpiled in small volumes, about 80 tons at a time, for treatment. The soil at the site was tight red clay, shale, sand and CR1 quarry blend (3/4-inch minus crushed stone) from a new excavation. In preparation for processing, the contaminated soil was stored on a concrete pad lined and covered with plastic. It was then loaded into the CleanSoil Model CSI-200 patented steam extraction machine in batch sizes of eight cubic yards. Steam was made in a standard boiler and introduced into the fully enclosed and sealed processing hoppers through a series of stancions, vertical pipes with holes through which the steam is injected into the soil. As the steam permeates the soil, the contaminant is removed via an effluent (water) and a vapor (steam) stream. The effluent is pumped to a frack tank, a holding tank in which the water and contaminants are separated; the effluent is stripped through carbon for reuse as makeup water for the boiler, eliminating any discharge. The vapors are sent to heat exchangers where they are condensed and where off gas is directed to carbon after cooling. The contaminants are drained and disposed of through a permitted facility or returned to the generator for recycling.

The New Jersey permit required monitoring of the off gas at the entrance to the first carbon canister, between the two active canisters and at the stack. This was accomplished with a portable analyzer that measured the actual VOCs. The results of the measurements confirmed that the system met the criterion in the permit, less than 640 ppm at the stack. The gas stream temperature was maintained at less than 10°F above ambient at the entrance to the first carbon canister assuring that the carbon remained efficient throughout the process. The temperature was continuously monitored throughout the entire project. The exit port of the stack was maintained at less than 10 cfm, with an average below 5 cfm.

The processing machine and emissions control equipment were set up at the site, and two carbon canisters were used at the final phase of both the air and water exit streams. Carbon was selected to process the water as it was reused as makeup water to the boiler. If any contamination had been carried over to the boiler, it would naturally enter the soil being processed through the steam injection and render the process inefficient.

Each of the two eight-cubic-yard processing hoppers was steamed to make sure that no contamination remained when the soil was removed. This produced an effective yield of three tons per hour. The smallest capacity machine, Model CSI-200, was used on this project, but larger capacity machines are available with yields up to 40 tons per hour.

Results

A total of 35 individual soil samples were collected to assure the soil was cleaned to the state's accepted levels. All samples yielded results of below 1 ppm, using test method SW8-46 8240 as required in the NJDEP permit.

The project, from mobilization to final disposal of the carbon canisters, was completed in eight weeks, and the price was more than 30 percent below market price for handling soil contaminated with hazardous substances. After the laboratory analysis determined it was clean, the remediated soil was backfilled on site. Using this technology, the site limited its potential liability due to off-site disposal of soil in a landfill, spent carbon was regenerated, and the product was recycled.

For more information, contact Kenneth Meekins, Soil Remediation Technology, LLC (609) 451-2330, or Bart Lebman, CleanSoil Inc., (213) 699-0413.

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Western Research Institute

Contained Recovery of Oily Wastes (CROW™)

Abstract

The Contained Recovery of Oily Wastes (CROW™) process is a commercially available, in situ technology ,used to recover oily wastes from saturated and unsaturated soil. The technology uses steam and hot water displacement to move accumulated oily wastes to production wells for aboveground treatment (D106605, p. 346). In situ bioremediation processes treat contaminant residuals. Operating CROW™ and bioremediation in sequence should provide complete remediation of organic hydrocarbons.

Dense organic liquids such as chlorinated hydrocarbons, coal tars, and heavy petroleum products can be heavier than water and immiscible with water, resulting in their downward migration through the saturated zone. CROW™ removes large portions of oily waste, stops the downward migration of organic contaminants, immobilizes residual oily waste, and reduces the volume, mobility, and toxicity of oily waste. The process can be used for shallow or deep contamination, and uses mobile equipment.

According to the technology developer, CROW™ can be used to displace both light and dense nonaqueous phase liquids (LNAPLs and DNAPLs) including pentachlorophenol (PCP) solutions, chlorinated solvents, creosote and petroleum byproducts. CROW™ does not substantially reduce contaminant levels in soils that do not contain free product.

Western Research Institute

Contained Recovery of Oily Wastes (CROW™)

Technology Description

1. Introduction

The Contained Recovery of Oily Wastes (CROW™) process is a commercially available, in situ technology used to recover oily wastes from saturated and unsaturated soil. The technology uses steam and hot water displacement to move accumulated oily wastes to production wells for aboveground treatment (D106605, p. 346). In situ bioremediation processes treat contaminant residuals. Operating CROW™ and bioremediation in sequence should provide complete remediation of organic hydrocarbons (D14390I. p. 344).

Dense organic liquids such as chlorinated hydrocarbons, coal tars, and heavy petroleum products can be heavier than water and immiscible with water, resulting in their downward migration through the saturated zone. CROW™ removes large portions of oily waste, stops the downward migration of organic contaminants, immobilizes residual oily waste, and reduces the volume, mobility, and toxicity of oily waste. The process can be used for shallow or deep contamination. and uses mobile equipment (D 14388O; D106605, p. 347).

According to the technology developer, CROW™ can be used to displace both light and dense nonaqueous phase liquids (LNAPLs and DNAPLs) including pentachlorophenol solutions, chlorinated solvents, creosote, and petroleum byproducts (D11691G).

2. History and Current Stage of Development

CROW™ was developed from applications used in the petroleum industry for secondary petroleum recovery (D11691G). Western Research Institute was granted a patent for the process in 1989 (U.S. patent 4,848,460) (D14394M). It is commercially available and has been used at the Bell Lumber and Pole Company Superfund site in Minnesota. Pennsylvania Power and Light has selected it to remediate the Columbia Superfund site and used it at the Brodhead Creek site.

3. Process Description

The CROW process recovers oily wastes from the ground by adapting a technology used for secondary petroleum recovery and primary production of heavy oil and tar sand bitumen. Steam and hot water displacement move accumulated oily wastes and water to production wells for above ground treatment.

Injection and production wells are first installed in soil contaminated with oily wastes. Low-quality steam is then injected below the waste. The steam condenses, causing rising hot water to dislodge the waste upward into the more permeable soil regions. Hot water is injected above the impermeable soil regions to heat and mobilize the oil waste accumulations, which are recovered by hot water displacement (D106605, p. 346).

The displaced oily wastes form an oil bank that the hot water injection displaces to the production wells. Behind the oil bank, the oil saturation becomes immobile in the subsurface pore space. The oil and water are treated for reuse or discharge (D106605, p. 346).

In situ biological treatment may follow the displacement and is continued until ground water contaminants are no longer detected. During treatment, all mobilized organic liquids and water-soluble contaminants are contained within the original boundaries of the oily waste. Hazardous materials are contained laterally by ground water isolation and vertically by organic liquid flotation. Excess water is treated in compliance with discharge regulations (D106605, p. 346). For a schematic of the overall CROW™ process, see Figure 1 in U.S. Patent 4,848,460 (D14394M, p. 1).

Mobility control polymers may be added to enhance recovery. Also, chemical additives may be used to extract specific compounds that pose immediate environmental concern or which resist microbial degradation (D14394M, sec. 5-6).

4. Involvement With Government Programs/Regulatory Acceptance

CROW™ has been tested at both the laboratory and pilot scale under the U.S. Environmental Protection Agency (EPA) Superfund Innovative Technology Evaluation (SITE) Emerging Technology Program. Based on the results of the Emerging Technology Program, Western Research Institute was invited to participate in the SITE Demonstration program. The technology was demonstrated at the Pennsylvania Power and Light (PP&L) Brodhead Creek site in Stroudsburg, Pennsylvania, in 1995 and 1996. Other sponsors, in addition to EPA and PP&L, are the Gas Research Institute, the Electric Power Research Institute, and the U.S. Department of Energy (D106605, p. 347).

5. Performance

In preliminary bench-scale testing the CROW™ process removed more than 60-weight-percent (wt %) of manufactured gas plant coal tars at 156 degrees Fahrenheit; and more than 80 wt % of creosote-wood treatment waste at a temperature of 120 degrees Fahrenheit from contaminated soils. Bioremediation implemented after CROW™ lowered contaminant levels even more - polynuclear aromatic hydrocarbons (PAHs) were reduced to 4 milligrams per kilogram (mg/kg) with the dual approach (D14390I, p. 357).

In a pilot-scale test at an aquifer contaminated with creosote and pentachlorophenol (PCP), the CROW™ process proved practical as a choice for full-scale remediation. Hot-water injection displaced 70 to 80% of the non-aqueous phase liquid (NAPL) in the soil, and PCP concentrations were reduced from 2,100 mg/kg to 3.6 mg/kg after flushing with 20 pore volumes of water (D14393L, pp. 12 & 15). See Case Study 1 for more information.

6. Limitations

CROW™ does not substantially reduce contaminant levels in soils that do not contain free product (D143901, p. 344).

7. Feed Rate or Capacity

During pilot scale testing, hot water injection rates averaged 4.5 gallons per minute. The fluid production rate averaged 6.5 gallons per minute (D14393L, p. 6).

8. Material Handling and Pretreatment Needs

No pretreatment is necessary.

9. Process Waste Streams

Recovered water is treated in an above ground treatment train. Suspended oils and solids are removed first, i.e. by gravity separation or chemical flocculation. The water is then treated by biological oxidation or by a combination of physical-chemical treatment (D14394M sec. 8).

10. Operator Requirements

No available information.

11. Utility Requirements

No available information.

12. Set-Up/Tear-Down Requirements

No available information.

13. Technology Reliability/Maintainability

No available information.

14. Public Acceptance

No available information.

15. Information Sources

D14394M, Johnson, et al., 1989

D14393L, Fahy, et al., October 1992

D106605, EPA, October 1995

D14390I, Calabrese & Kostecki, 1992

D14388O, Western Research Institute, Date Unknown

D11691G, Ground Water Monitor, April 1995

Western Research Institute

Contained Recovery of Oily Wastes (CROW™)

Technology Cost

The cost of applying CROW™ technology is largely dependent upon site characteristics and size, as well as the extent of the process monitoring required. According to the vendor, the larger the site, the lower the cost per cubic yard (yd^3) of contaminated soil. For example, a 2.6 acre site has a projected cost of $30/$yd^3$, while a 0.2 acre site has a projected cost of $250/$yd^3$. Both sites have a 20 to 30 foot thick contaminated zone within a highly permeable aquifer (D14389P).

In 1995, CROW™ technology was anticipated to cost from $50 to $125 per yd^3 of Soil treated (D 12467E, p. 72).

At the Brodhead Superfund site in Stroudsburg, Pennsylvania, using the CROW™ technology cost at least $1.3 million less than the projected cost of excavation and disposal. The estimated price tag at the time (1990) was $3.3 to $6.8 million, depending on the ultimate disposal of the excavated material (landfilling or incineration). The CROW demonstration will cost approximately $2 million (D14391J).

Information Sources

D12467E, Udell and Sitar, 1995

D14389P, Johnson, December 1996

D14391J, Villaume, June, 1996

Western Research Institute

Contained Recovery of Oily Wastes (CROW^{TM})

Case Study Overview

In a pilot-scale test at an aquifer contaminated with creosote and pentachlorophenol (PCP), the CROW^{TM} process proved practical as a choice for full-scale remediation. Hot-water injection displaced 70 to 80% of the non-aqueous phase liquid (NAPL) in the soil, and PCP concentrations were reduced from 2,100 mg/kg to 3.6 mg/kg after flushing with 20 pore volumes of water (D14393L, pp. 12 & 15). See Case Study 1 for more information. A full-scale remediation using CROW^{TM} was conducted at the Bell Lumber and Pole Company Superfund site. Results are not yet available (D14392K).

CROW^{TM} is being used for a full-scale remediation at the Brodhead Creek Superfund Site in Stroudsburg, Pennsylvania to mobilize and displace coal tars, pentachlorophenol, creosote, and petroleum by-products. Hot water is injected through six wells at the site to dislodge contaminants in the soil matrix. The wells were placed at a depth of 27 feet to 35 feet and hot water was injected at a total rate of 100 gallons per minute (D14392K, p. 4).

Information Sources

D14392K. EPA, April 1995

D14393L, Fahy, et al, October 1992

IN SITU THERMAL DESORPTION

A new two-fold process uses thermal blankets to vaporize soil contaminants and a vacuum to draw gases out of the ground

By Jude R. Rolfes

Shell's *in situ* thermal desorption technology is a revolutionary approach to handling difficult soil contamination problems in a cost-effective manner. For certain types of dangerous and environmentally unacceptable chemicals, it provides a solution that previously did not exist.

Although TerraTherm Environmental Services Inc., an affiliate of Shell Oil Co., was formed last year to develop and utilize thermal desorption, the process itself is hardly new. TerraTherm has applied decades of Shell's research and experience in oil field technologies to this environmental issue.

The technology is unique because of its *in situ* nature, which allows it to remediate an entire site without moving any soil. The process desorbs and destroys the contaminants. The destruction of the contaminants occurs directly in the soil, which is heated to temperatures ranging to 1,000 degrees Centigrade within a closed system.

Currently, there are two applications of *in situ* thermal desorption. The thermal blanket works on soil contamination at the surface, like a powerful electric blanket combined with a vacuum cleaner, while thermal wells clean the soil at greater depths, making use of heating elements placed in wellbores.

There are two components to the integrated system. Thermal blankets or thermal wells are used to heat the soil and destroy the contaminants while a separate vapor treatment system handles the offgases.

In situ thermal desorption can be applied to a wide range of volatile and semi-volatile organic contaminants, including chlorinated solvents, polychlorinated biphenyls (PCBs), pesticides and petroleum wastes in soils varying from low permeability clays to heterogeneous soil compositions. The process can clean sites that were once deemed uneconomical for cleanup.

Man-made chemicals like PCBs are very stable compounds that don't decay by nature. They won't go away. Bioremediation won't work. In the past, treatment methods required digging up the soil and hauling it away for incineration or to a landfill for hazardous waste in compliance with the Resource Conservation and Recovery Act (RCRA) regulations. With its new technology, TerraTherm has the capability to destroy PCBs on site, eliminating these complications and additional expense.

The process reduces the contaminants in the soil to very low levels—lower than EPA requirements.

The process reduces the contaminants in the soil to very low levels—lower than U.S. Environmental Protection Agency requirements. Destruction is essentially complete. Nothing is carried offsite, condensed or produced on the surface. Due to the nature of the process, it is very low-profile, with low impact on a neighborhood where a site is located. There is virtually no odor or dust resulting from the remediation process.

Unique to TerraTherm's system is that it provides tailor-made solutions for individual problems. The technology is especially effective in handling difficult cleanup problems that occur in the chemical and refining industries, pipelines and distribution processes, utilities, railroads and military installations. The *in situ* nature of the system makes it most appropriate for these facilities.

Remediating pesticides at a chemical plant or cleaning the complex mix found in a waste pit at a refinery are ideal uses for this technology.

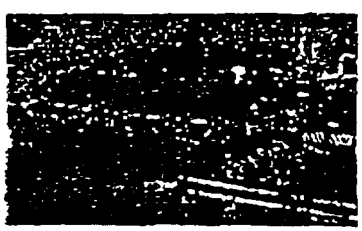
In the utility industry, PCBs were used as insulation and coolant oil in transformers and large electric motors and capacitors over a 30-year period. *In situ* thermal desorption is especially useful in cleaning up sites where this equipment was manufactured, stored or serviced. The same is true for manufactured gas plants (MGPs), which were in operation a hundred years ago in the eastern and midwestern United States, and left

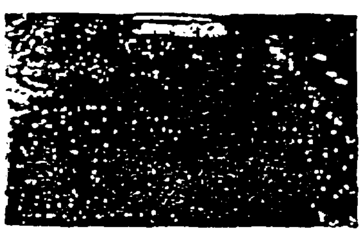
behind tar residues and other carcinogenic compounds.

Railroads provide another good example of this technology's flexibility. In the Northeast, where railroads have been electrified for many years, there are significant PCB problems in rail-yard shops that overhaul engines. *In situ* thermal desorption can be used to remediate the soil without moving tracks or shutting down the rail yard.

TerraTherm has put this new technology to the test at sites around the country, and has proven it to be effective and safe. In 1996, thermal blankets were applied at an upstate New York Superfund site where PCB contamination was as high as 5,000 parts per million (ppm). After treatment, soil target levels of less than 2 ppm PCBs were met, and air emissions were well below New York and EPA regulatory limits.

Actually, *in situ* thermal desorption had its inception in the oil fields of California. Since 1959, Shell has been doing thermal enhanced recovery in its oil fields there. Scientists at Shell's Houston, Texas, research center began developing a remediation process using these same principles in 1988. *In situ* thermal desorption was the result. Drs. Harold J. Vinegar, George L. Stegemeier and Eric DeRouffignac are credited as being the key developers of this breakthrough technology.





Thermal wells deliver heat below the surface using heating elements placed in wellbores drilled on a regular pattern. The typical well spacings can be 7 to 10 feet. As the heat from the wells vaporizes the soil contaminants, a vacuum applied to the same wells draws the contaminants out of the ground. Dr. Vinegar has observed that the wells can be drilled vertically to the contaminated zone, possibly as deep as several hundred feet, and can reach horizontally under obstacles.

Thermal blankets, 8-foot-by-20-foot rectangular steel boxes, can be used side-by-side in remediating surface contamination. Shell's simulations suggest they will work to a depth of approximately 3 feet. With blankets placed over the area, contaminants are vaporized by heating the soil. Heating elements in each blanket can reach 800 to 1,000 degrees Centigrade at the surface. As the heat front moves through the soil, contaminants are vaporized and a vacuum system draws the vapors toward and through the blankets. Most contaminants are destroyed in the soil near the heat source.

The vapor treatment system is the second major component of the technology, treating contaminated vapors drawn out of the soil. Any remaining vapors not destroyed by the thermal wells or thermal blankets are drawn through this closed system. Effluent vapors are processed using a cyclone separator to capture particulates while a flameless thermal oxidizer destroys organics, and activated carbon adsorbers provide both final polishing and a significant margin of safety. As a result, carbon dioxide and water are virtually the only air emissions. The site is then ready for immediate revegetation.

Individual remediation activity is designed through the aid of sophisticated computer simulations. Temperatures are monitored throughout the remediation process, and soil samples are taken pre- and post-treatment. EP

Jude R. Rolfes is the president and chief executive officer of TerraTherm Environmental Services Inc. in Houston, Texas.

For more information, circle 68 on card.

CaseHistory

Destroying PCBs in Soil at a Dragstrip—In Situ

Mike Attaway
TerraTherm Environmental Services

Removal of organic contaminants is an important environmental issue, yet unfavorable economics has delayed or prevented many cleanups. Ex-situ techniques (such as excavation and transport to incineration facilities or landfills) are expensive and disruptive and have been increasingly displaced by multistage processes (such as soil washing) and in-situ technologies as they have developed. Some in situ technologies gaining in use are soil vapor extraction, bioremediaiton and thermal desorption. Regarding the latter, heat greatly assists the desorption of any organic material and can speed removal times a thousand-fold compared to removal at ambient temperatures. The difficulty of the past has been applying heat cost effectively to large sites. The case histories presented here discuss the use of a new thermal desorption technology that has recently become commercially available for in situ treatment. The technology was demonstrated recently in a series of soil remediation projects where contamination consists of high concentrations of recalcitrant organics such as polychlorinated biphenyls (PCBs), petroleum hydrocarbons and chlorinated solvents.

The thermal blanket technology was used to remediate PCB contaminated soil to a depth of six inches at a former dragstrip in New York as well as chlorinated solvents at other sites. Once each "electric blanket" is connected to the power source and to a vapor collection system, the unit can begin heating and treating contaminants, first at the soil surface and then in a trailer-mounted oxidizer and carbon filter system.

Problem

A dragstrip in Glen Falls, NY, became heavily contaminated in the late 1970s when waste oil containing PCBs (predominantly Aroclor 1242) was sprayed on the dragstrip for dust control. PCBs are particularly difficult to extract from soils because they are insoluble in water and have a high boiling point (>300°C). The site had an average PCB concentration over 500 ppm with some concentrations ranging beyond 5,000 ppm.

Solution

Soil tests showed the PCB contamination to be greatest within the first six inches of soil depth. As such, the site was ideal for testing and demonstrating a new in situ thermal and vacuum technology that applies heat directly to the soil. The technology was introduced in 1994 by TerraTherm Environmental Services, of Houston, TX. The results of the demonstration, completed in late 1996, were part of a process for TerraTherm to obtain a nationwide Toxic Substances Control Act (TSCA) permit for the remediation of surficial soils containing PCBs and other contaminants.

The job was the first major project using the company's technology, which is called In Situ Thermal Desorption. The technology combines the use of an electrically heated, impermeable blanket placed directly on the affected soil with vapor collection equipment. Each "blanket" is actually constructed of a steel frame from which is suspended a layer of stainless steel webbing. Heating rods are threaded through the webbing to transfer the heat into the soil below the blanket. The structure is placed directly on the surface of the soil to be treated. After placement over the soil, the blankets are covered with a fiberglass reinforced silicon rubber sheet and sealed at the edges to prevent vapor escape. PCBs and other organics and water in the soil are vaporized as the blanket is heated up to 1,100°C. Vapors are then drawn out of the soil and through the blanket by a vacuum system. Virtually all of the contaminants (typically more than 90 percent) are oxidized by the blanket near the soil surface. Any remaining vapors are fed to a trailer-mounted treatment system. The treatment system incorporates a cyclone separator to capture particulates and a flameless thermal oxidizer, which converts the remaining hydrocarbons into carbon dioxide and water. The oxidizer exhaust is then cooled to between 110° and 180°C before passing through a granular activated carbon adsorption unit and vented to the atmosphere.

Several blankets set up side-by-side increase the total area to be treated at one time. The Glen Falls project was conducted on an area of 4,800 square feet. Five thermal blankets, each covering 160 square feet, were used to treat 800-square-foot sections at a time. The soil is sandy with a porosity of 35 percent and a dry density of about 1.7 grams per cubic centimeter.

While PCBs were found primarily in the top six inches of soil across the site, the project was designed to remove PCBs down to 12 inches below the surface.

Besides PCB concentration in the remediated soil, parameters monitored to help gauge the efficiency of the technology included: soil temperatures during the test period, oxidizer temperature, stack emissions of PCBs and dioxins, carbon monoxide in the effluent, flow rate through the system and vapor temperature at the carbon bed inlet. In addition, at the request of the EPA, soil samples were analyzed to verify that lateral and vertical migration did not occur as a result of treatment.

Because of soil moisture, the soil temperature rises slowly at first, to about 100°C and stabilizes temporarily, then rises further as water is boiled off.

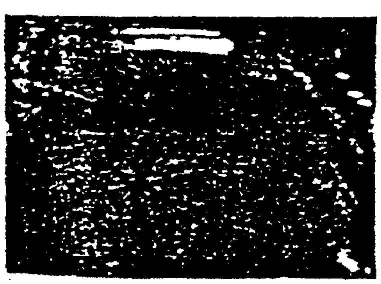
Results

The thermal blanket was operated at temperatures ranging from 815° to 925°C. It took about 10 hours for the blanket heaters to reach their top operating temperature, and about 20 to 24 hours for the soil at a depth of about six inches to reach 200°C, which was sufficient to reduce PCB concentrations to the objective levels. Before heating the soil, the highest average PCB concentration in any of 18 samples was 68? ppm at depths up to three inches and 100 ppm at depths from three to six inches. Post-heating soil samples indicated that PCB concentrations were reduced to well below the cleanup target of 2 ppm on all but one sample, and the average was below 2 ppm, with many concentrations as low as 0.03 ppm.

The cost of treatment by this technology at large commercial sites (>15 acres) to a depth of six inches was shown to be about $150 per ton of soil treated for this project. The cost can be affected by high moisture of the materials to be treated. While it would not preclude the use of the technology, the energy cost to remediate a site rises with the amount of water that must be vaporized during treatment. This problem can be circumvented in some projects by use of dewatering pumps or drainage ditches and other means of keeping water from returning to the area being treated.

Encore

Since completing the drag strip project using thermal blankets, TerraTherm has also begun using of a related technology, thermal wells, which can be used to treat organic contaminants in situ at greater depths. In thermal wells, the heating elements are placed in vacuum wellbores drilled into the soil in a regular pattern. As the heat from the well vaporizes the soil contaminants, a vacuum applied to the wells draws the contaminants out of the ground. As with the thermal blanket system, destruction of any remaining organic contaminants is completed in a flameless thermal oxidizer.



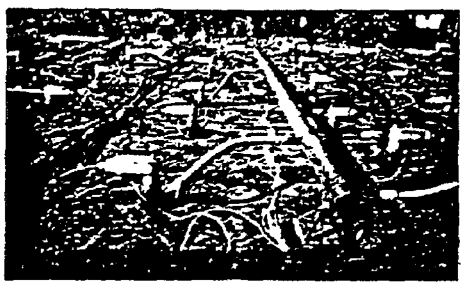
The top few inches of cleaned soil in Glen Falls, NY appears reddish brown and contrasts with adjacent oil-blackened yet to be remediated. The soil has turned red because the iron in the soil has oxidized to its Fe^{3+} state. Once remediated, the soil is ready for normal revegetation procedures.

The thermal wells

were used in a soil remediation project this spring in Cape Girardeau, MO. There, at a six-acre site and former location of a motor and transformer repair and sales business, PCB Aroclor 1260 concentrations registered as high as 19,900 ppm.

For the project, electrical heating and vacuum were applied to an array of 12 wells spaced five feet apart. Heating was applied through electrical heaters to a depth of 12 feet for a period of 42 days. Soil temperatures were monitored throughout the period and soil samples were taken with a Geoprobe coring unit to verify contaminant concentrations before and after heating. Wells operating at temperatures up to 980°C (on average) produced temperatures between 480° and 535°C in the soil between wells, reducing PCB concentrations to non-detect levels (<33 ppb, by EPA Method 8080) in the center of the test area and below 2 ppm throughout the test site.

Except for dewatering, soil treated by thermal wells or thermal blankets will not be structurally altered, even when operating temperatures approach 1,000°C. Immediately after treatment, the soil is sterile, but experience shows the recovery is rapid. If soil is disked, fertilized and seeded following normal revegetation sequences, regrowth should match that of other soils.



Thermal wells have been developed to treat soils in situ to depths equal to any wells can be drilled. The technology, which uses heating elements placed in wellbores drilled on a regular pattern, is currently in use to remediate soil contaminated with chlorinated solvents to a depth of 20-feet below the surface in Portland, IN.

While the soil can be readily revegetated, the drying nature of the technology does change some characteristics of the soil. For instance, at the Cape Girardeau project, the treated clay lost some of its plasticity and became very dry, dense and fine grained. Upon rehydration, the treated clay's plasticity appeared to be lost and the soil behaved as a clay-size sand.

What's Next?

Thermal wells technology is also currently being demonstrated at a site in Portland, IN, where an industrial area is contaminated by 1,1-dichloroethylene. DCE contamination ranges from 390 to 480 ppb at a depth of six to eight feet and 650 ppb at a depth of 10 to 12 feet. The objective of the demonstration is to reduce DCE concentrations to less than 80 ppb. Fifteen thermal wells were drilled to a depth of 12 feet. Results are only preliminary, but they indicate reduction to levels of 1 to 3 ppb DCE in all but one test area, and that area exhibiting a level of 9 ppb.

Pesticides and fuel oils are examples of other contaminants that can be desorbed thermally. Field demonstrations also are planned for collection and capture of low boiling point metals, such as mercury.

For more information, contact Mike Allaway, TerraTherm Environmental Services, (281) 296-1000; (800) 200-5288. TerraTherm is a subsidiary of Shell Technology Ventures Inc., which developed the heating technology as part of its oil recovery efforts.

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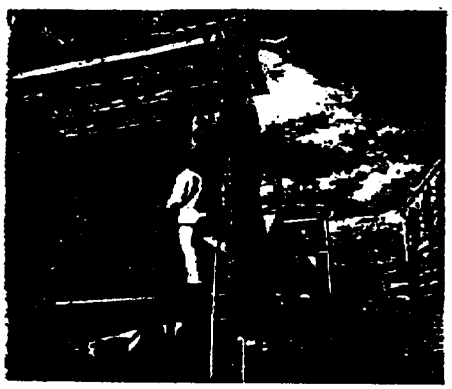
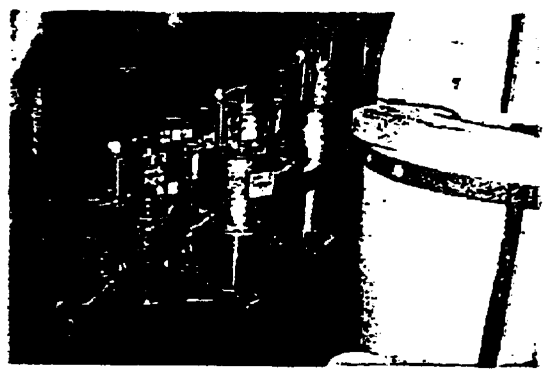
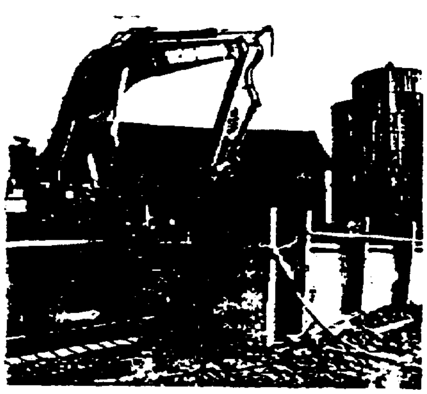
Environmental Protection Agency
Development (RD 681)
February 1992

EPA

Bio Trol Soil Washing System for Treatment of a Wood Preserving Site

Applications Analysis Report

SITE
SUPERFUND INNOVATIVE
TECHNOLOGY EVALUATION

EPA/540/A5-91/003
February 1992

BioTrol Soil Washing System for Treatment of a Wood Preserving Site

Applications Analysis Report

Risk Reduction Engineering Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, OH 45268

Abstract

This project was an evaluation of the BioTrol, Inc. Soil Washing System (BSWS), consisting of a proprietary mechanical soil washer and separation system, a Slurry Bio-Reactor (SBR) provided by EIMCO Process Equipment Co., and BioTrol's proprietary, Aqueous Treatment System (BATS), a fixed-film, aerobic biological treatment process. In this study, both biological processes use bacterial populations selected to specifically degrade pentachlorophonol (penta).

This report summarizes and analyzes the results of the Superfund Innovative Technology Evaluation (SITE) Program's demonstration at the MacGillis and Gibbs Company wood preserving site in New Brighton, MN during the Fall of 1989. Extensive sampling andanalysis were carried out to establish a data base against which the vendor's claims for the technology could be evaluated reliably. Data from other investigations by BioTrol are included to support the demonswattion results. Conclusions were reached concerning the technological effectiveness and economics of the process and its suitability for use at other sites.

The primary conclusions from the demonstration study are:

(1) The Soil Washer effectively segregates the local soil into a coarse, relatively uncontaminated fraction constituting the largest output portion, smaller fractions of coarse and fine woody debris, and a contaminated fine fraction accounting for about 10% of the input solids weight.

(2) Starting with soils containing either 130 mg/kg or 680 mg/kg of penta, the removal efficiency for penta in the Soil Washer, defined as the change in contaminant concentration (weighted average) between the feed soil and die washed soil output stream. ranged between 89% and 87%. Removal efficiencies for polynuclear aromatic hydrocarbons were slightly lower, 83% and 88%, in tests with two soils. Concern about the efficiency of the extraction step during analysis of the feed soil, leading to low penta and PAH values, suggests that these values may be biased low. The vendor claims a 90% removal efficiency.

(3) Based on thedemonstration study, 27.5% to 33.5% of the pentachlorophenol mass is concentrated in the fine particle cake fraction (as-is weight basis). between 18 and 28% is found in the coarse and fine oversize, and 34% to 39% is found in the processing water. The washed soil retains only about 9%. Thus, while washing or extraction of pentachlorophenal takes place, the predominant affect of the soil processing was segregation of coarse and fine particles. Similar distribution occurs with PAHs except that extraction into the aqueous fraction is much smaller due to the much lower solubilities.

(4) While steady-state operation was not achieved in the anticipated acclimation time (one week), the Slurry Bio-Reactor did achieve pentachlorophenol, removals as high as 93% and, based on extrapolation of the data, may well be capable of even higher removal levels.

(5) The BATS successfully degraded between 91 and 94% of the pentachlorophenol in the aqueous process liquor, the Combined Dewatering Effluent (CDE).

(6) Combined capital and operating costs for the integrated system am estimated at $168/ton of feed soil, based on the MacGillis and Gibbs site. The Soil Washer accounts for about 90% of the cost followed by slurry biodegradation of the fine particle slurry (about 2%) and treatment of the aqueous stream (about 1%).Unassigned

costs contribute about 5% to the total cost. Incineration of the woody debris found in the soil is a major component of the Soil Washer costs, contributing about 80% of the Cost.

(7) On an individual unit basis, costs for die process were:

Soil Washer	\$185/metric ton or \$154/short ton of soil or \$197/yd ^{3} (including incineration)
SBR	\$9.22/1000 L or \$34.39/1000 gal of 20% slurry
BATS	\$0.44/1000 L or \$1.65/1000 gal of water treated

Secondary conclusions that have been reached on the basis of the demonstration study and other data provided by the vendor include:

(1) The Soil Washer also separates highly contaminated coarse oversize (wood chips) and fine oversize (sawdust) fractions, typical of wood preserving facilities. These fractions may be incinerated.

(2) The nature of the soil has a significant effect on the efficiency of soil washing and/or the segregation into coarse and fine fractions that can be achieved. The soil character (e.g., particle size) must be considered in evaluating the applicability of the Soil Washing System.

(3) Depending on the nature and concentration of contaminants of concern, acclimation of the Slurry Bio-Reactor may take considerably longer than the expected one week. Laboratory scale experiments would be needed in each case to establish the acclimation period. This may be important in scheduling and integrating units for a particular site.

(4) The system is not without mechanical problems and complexities that still need to be resolved. For example, clogging in the soil feed system forced a reduction in Soil Washer operating rates, and foaming in the BATS, probably due to thickening agent added for dewatering of the fines, created operational problems.

(5) The units evaluated in the demonstration study may not be appropriately sized for integrated operation. Similarly, for a full scale system, calculations have indicated that a BATS capacity of about 300 gpm would be needed for the proposed 20 ton/hour soil processing rate. However, as discussed in the report, reuse of at least a portion of the proms water without treatment may be possible.

Section 1
Executive Summary

Introduction

One configuration of BioTrol, Inc.'s Soil Washing System (BSWS) has been used to treat pentachlorophenol-contaminated soil at a site on the Superfund National Priorities List. Operational and cost data were collected for that investigation and serve as the primary basis for an evaluation of the utility of this sequence of processes for remediation of other sites across the Nation. Supporting data from other studies and evaluation of one or more of the processes at other sites are discussed in Appendix D.

Conclusions

Based on the results of the SITE demonstration project at the MacGillis and Gibbs site in New Brighton, MN and information concerning other studies provided by the vendor, BioTrol, Inc., for different wastes at other sites, several conclusions can be drawn.

- The Soil Washer is capable of segregating penta contaminated feed soil (FS) into a major fraction of washed soil (WS) retaining little (-10% by weight) of the penta; smaller coarse and fine oversized (CO,FO) fractions retaining contamination (-20-30%),probably as woody debris; a fine particles (FPC) fraction retaining the bulk of the contamination (~30%) in a small mass; and a penta-contaminated (~30%) aqueous stream called the Combined Dewatering Effluent (CDE).

- Removal efficienceis for penta removal, defined as the change in concentration from the feed soil to the washed soil output stream (1-WS/FS), averaged 89% in the soil washer test for a soil with a low penta concentration.(130 mg/kg) and 87% in the test with the high penta (680 mg/kg) soil.. These values are only slightly less than the vendor's claim for a 90% removal efficiency. The removal efficiencies for total polynuclear aromatic hydrocarbons (PAHs) were slightly lower, 83% and 88% in the two tests.

- Once acclimated, the Slurry Bio-Reactor (SBR) should be capable of biologically degrading over 90% of the penta contamination in the fine particle fraction. Concentrations of polynuclear aromatic hydrocarbons are also extensively reduced (>70%). Because of longer- than-anticipated acclimation attributed to very high penta concentration in the slurry, the system was not at steady-state for much of the 14 day test. Consequently, the removal achievable under steady-state operation could not be determined.

- The fixed-film biological treatment system (BATS) is capable of destroying at least 91% of the penta- chlorophenol in the process water from the soil washer after acclimatiion with a penta-specific bacterium. Because of low influent concentrtions and high detection levels, removal of PAHs could not be determined.

- The removal of PAHs from the bulk of the soil and concentration in the fines fraction appears to parallel the behavior of the pentachlorophenol, except that little is found in the process water, the Combined Dewatering Effluent, probaly due to lower solubility.

- Other constiuents commonly encountered at such sites, including oils and heavy metals, were re moved from the washed soil to varying degrees (removal effciency: oil: 80-90% copper, chromium, and arsenic: 50-70%).

- Predicting operating costs for other sites is difficult since one or more of the three processes may not be needed (or the most attractive alternative) for a particular site. Sizing of each process unit also must be considered within a particular scenario and will be dependent on time constraints for a cleanup, volume/characteristics of soil, etc.,

- On the basis of an assumed 30,000 yd^3 of soil to be processed in a commercial system at the MacGillis and Gibbs site using a 20 ton/hr Soil Washer coupled with appropriately sized Slurry Bioreactor (23 gpm) and BATS (three 100 gpm) units, the cost (amortized capital plus operating), based primarily on the demonstration study, is estimated at $168/ton of feed soil.

- The Soil Washer accounts for 90% of the total cost, with incineration of the woody debris contributing to about 80% to the calculated Soil Washer cost. Slurry biodegradation accounts for 2% of cost and aqueous of treatment accounts for 1% of the cost. Unassigned costs contribute the remaining 5%.

- Since all three unit operations may not be necessary for a site, the following unit costs were also developed:

Soil Washer	\$154/ton or \$197/yd^3
Slurry BioReactor	\$34.39/1000gal of 20% slurry
BATS	\$ 1.65/1000 gal of process water

- Operating labor was a major operating cost factor for all three units.

- A major contributor to the cost for the Slurry BioReactor is the volume or mass of fines produced per unit mass of feed sod, which translates directly into the volume of slurry that will need to be treated. The developer indicates that the Soil Washer System is effective with soils containing less than 25% slightly fines.

- While contaminant concentrations and flow rate attainable would be major contributors to the operating cost of the BATS, these factors are not major considerations in the overall economics, assuming that regulatory requirements for return of the washed soil to the site can be satisfied.

- One advantage of the Slurry Bio-Reactor and the BATS processes over other biological treatment processes is that they generate minimal quantities of sludge that would require solids separation and disposal.

- Auxiliary equipment needed to support this process is comparable to that for other aboveground treatment systems, such as excavation and prescreening of soil to remove oversized material and debris, oil/water separators and clarifiers for pretreatment of process water going to the BATS, and polishing filters, carbon adsorbers. etc. that may be needed for the effluent to meet local discharge requirements.

Discussion of Conclusions

The mobile pilot system tested at the MacGillis and Gibbs site consisted of a Soil Washer (SW) with a nominal capacity of 500 lb/hr wet (as is), a Slurry Bio-Reactor (SBR) with a throughput capacity of about 0.024 L/min (0.38 gal/hr) as a 2-10% slurry, and a pilot scale BioTrol Aqueous Treatment System (BATS) with a nominal hydraulic capacity of about 10 gpm. All units can be transported to a site for use in an evaluation.

Extensive data were collected over various segments of a six week period to assess the ability of the system to concentrate and then degrade pentachlorophenol and polynuclear aromatic hydrocarbons from the soil at the site; to establish the operational requirements of the system and its individual components; and to arrive at the costs of operation in such a manner that future decisions could be made as to the viability of one or all of the units for other sites. The data from this study serve as the primary basis for the foregoing conclusions. Additional supporting evidence was provided from other studies by BioTrol.

An extensive Quality Assurance (QA) program was conducted by SAIC under the supervision of EPA's QA program, including audits and data review along with corrective action procedures and special studies to resolve specific data quality problems. These programs are the basis for the quality of the data derived from the SITE project. Discussion of the QA program and the results of audits, data review, and special studies can be found in the Technology Evaluation Report.

Two feed soils, containing different penta concentrations, were prepared from the available soil for the study. The "low penta" concentration soil was prepared by mixing slightly contaminated soil from a former penta processing area with a more highly contaminated soil previosly excavated at the site by BioTrol. The "high penta" soil was used as excavated. The primary variables studies were:

A. In the soil washer:
   a. input and output stream flow rates and totals
   b. penta concentration of input and output streams
   c. PAH concentrations of input and output streams
   d. soil characteristics
B. In the Slurry Reactor
   a. overall penta concentration
   b. penta distribution between solids and liquid
   c. PAH distribution
C. In the BATS:
   a. penta concentration
   b. effects of metals, oil,ect.

The results of the SITE project demonstrated that the soil washing process successfully segragated coarse soil (major fraction) from fine clay and silt (small fraction). While the bulk of the mass review in the coarse soil, the bulk of the penta and PAHs are in the fines fractions. In addition, woody debris was remived as coarse and fine oversize fractions, and a aqueous stream containing considerable penta but little PAHs was generated. Of these, the key product streams were the washed soil and the fine particle cake (clay/silt), although the coarse oversize fraction also retained a signifigant mass of penta, probably in woody debris.

While one option may be off-site disposal of the highly contaminated but small volume and weight of fine particle material, a more attractive option may be treatment of that material on-site in equipment such as the Slurry Bio-Reactor. This unit was tested on the small portion of the fine particle output stream. Over 90% of the pentachlorophenol and over 70% of the PAHs were removed in the SBR when the system had been stabilized. leaving a fine particle slurry with minimal contamination.

The system is a net consumer of water, absorbing about 10% of the 1200-1500 gallons introduced to transport and process each ton of soil. Municipal water, treated effluent from the BATS, and a dewatering polymer stream fed to the thickener provide this water. Dewatering of the solid fractions produces wastewater (Combined Dewatering Effluent, CDE) contaminated with the pollutants of concern, in this case penta and PAHs. The penta concentrations in the aqueous stream, up to its solubility limit of 80 ppm in the test with the high penta soil, appear to validate BioTrol’s claim that the soil is washed or extracted as well as segregated by particle sizes.

BioTrol's fixed-film aerobic reactor (BATS) successfully treated this wastewater (at 3 gpm), degrading over 90% of the penta and producing an effluent suitable for recycle or discharge at the MacGillis and Gibbs site. In retrospect, there is some question whether there is a need to or benefit from treating all of this water before recycle. Losses to the various soil fractions, replaced by uncontaminated municipal water, may avoid buildup of penta (and perhaps metals). One option may be to treat a blowdown of the wastewater before recycle to assure that penta and other contaminants do not affect the quality of the washed soil product. Obviously, considering the capital cost for the BATS at $250,000 for 300 gpm capacity, this could lead to considerable savings.

While the primary factor in the evaluation of the system is the amount of penta on particular fractions of the soil, a second critical factor is the concentration of key pollutants that can be tolerated in the feed to the SBR and the BATS. At least on a small scale, this study demonstrated that the Slurry B io-Reactor is capable of tolerating up to 5500 ppm of penta (dry weight basis) on the incoming fines in the slurry. Atsuch a level, the solid surfaces may be inhibitory or toxic to penta-degrading bacteria. Nevertheless, the fine solids may serve as a reservior of penta for the liquid phase until the absorbed film finally reaches a concentration amenable to biodegration on the surface. The dispersed bacterial population would only see and degrade the soluble penta (under 100 ppm), which is much more tolerable based on BATS results obtained by BioTrol in other studies.

Secondary pollutants such as oils and metals (including copper, chromium, and arsenic from current CCA wood treatment) did not appear to interfere with any of the three processes, at least not at concentrations present in the soils (20-40 ppm each for arsenic, copper, and chromium in the high penta soil test) and the duration of the tests during the demonstration. If necessary, oil removal could be incorparated into the soil washing sequence or into the BATS. The cenrifuge used to separate oil if present. While there was some indication that metals were building up as the wastewater was recycled from BATS to soil washing, the short duration of this investigation did not make it possible to establish if an inhibitory effect might be observed in continuous operation. Clearly, such problems are surmountable, as by the incorparation of metal precipitation, but overall treatment cost would increase accordingly and additional hazardous wastes wouldhave to be managed.

Several of the polychlorinated dioxins and furans were found in the soil and in some of the output streams at widely varying but low concentrations. Of these, the octachlorodioxin was the major isomer and the crucial isomer, 2,3,7,8-TCDD, was not detected. While concern over these pollutants as byproducts from the manufacture of penta has, to date, delayed disposal of the wastes from the demonstration, thier presence is not expected to affect large scale remediation once safe disposal levels are established and approved disposal routes are designated.

PHYTOREMEDIATION CAN BE DESIGNED FOR MGP SITE CONTAMINANTS

By George E. Boyajian, Ph.D.,
And Richard B. Sumner

There are more than 1500 contaminated manufactured gas plant (MGP) sites in the United States where projected remediation costs range from $1 million to tens of millions of dollars per site. These expensive cleanup projections reflect the \high cost of current remediation methods for MGP contaminants, usually polynuclear aromatic hydrocarbons (PAHs), BTEX compounds, and cyanide compounds.

In addition to significant cost savings over conventional methods, phytoremediation technologies permanently destroy PAHs, BTEX and cyanide compounds in situ, eliminating future environmental liabilities.

Disadvantages of current remediation methods

Source remediation at MGP sites has largely been dominated by combustion, recycling and landfill disposal. Plume contaminant and groundwater treatment has been limited to indefinite pump-and-treat systems. All of these solutions, in addition to being costly, have shortcomings that can be addressed by innovative technology.

Combustion remedies may require landfilling of solids containing hazardous compounds that are not converted. Recycling involves strict requirements on MGP residuals during transport to recycling facilities and on resulting commercial products. Land disposal is not a permanent solution, so it is discouraged under SARA. Hazardous components must be transported to fully permitted RCRA subtitle C hazardous waste landfills. All three of these solutions are ex situ technologies. Pump-and-treat does not address the source area and also often involves an indefinite operating time.

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Specialized solution for specialized sites

Every MGP site presents a unique combination of contaminants and environmental variables that affect which plant species can achieve cleanup standards. Laura Carreira, Ph.D., principal research scientist at PhytoWorks Inc., has developed proprietary biochemical technologies that enables PhytoWorks to rapidly screen native plant species for their ability to destroy organic contaminants. Alternatively, PhytoWorks selects appropriate plants from a library of pre-screened species. Plants selected by the proprietary techniques that can treat site-specific contaminants are then sown in an engineered phytoremediation system.

To complement organics destruction with site-specific plants, Richard Meagher, chief scientific officer at PhytoWorks and head of the genetics department at the University of Georgia, has genetically-engineered several common plant species with patented genes to remove mercury and other heavy metals from contaminated soil, sediment and water. Combining these proprietary beochemical techniques with patented genetic engineering, PhytoWorks will be engineering plants capable of treating both heavy metals and organic contaminants. Plants which treat such mixed waste can be created by inserting the genes responsible for metal uptake into plants with superior organic destruction capabilities.

The phyto solution

Phytoremediation solutions can replace or complement traditional remediation methods at MGP sites, compensating for many of their shortcomings. Phytoremediation can treat mercury and most organic contaminants including PAHs, BTEX compounds, cyanide compounds and many other contaminants found at MGP sites. These in situ solutions reduce costs and eliminate exposure pathways associated with excavation. Phytoremediation can also complement hot spot excavation by treating surrounding soils where contamination is more dilute and excavation is not cost-effective.

Phytoremediation also stabilizes MGP sites by preventing surface erosion and, depending on site requirements and system design, controlling subsurface contaminant migration.

Phytoremediation technologies are permanent treatments in that destroy organic contaminants and recover heavy metals. Upfront capital costs for phyto are minimal because there is no new equipment to be purchased and installed. Implementation is inexpensive as it uses basic agricultural techniques. Operating costs are significantly reduced by plants' unique ability to harness the sun's free energy and their negligible O&M requirements.∎

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remediated to date. It is believed that this level of progress is indicative of the complex nature of the site, the difficulty associated with fully characterizing the nature and extent of site contamination, and the lack of remedial technologies that can cost-effectively return the sites to pristine, background environmental conditions.

To date, very few MGP sites have been identified as posing imminent risks to the environment or public health. Instead, the remediation of these sites has been driven primarily by non-environmental factors such as the redevelopment and sale of urban or brownfield properties. These situations have afforded the utility industry the time to prudently manage these sites given changing regulatory conditions, the need to seek cost recovery from other involved parties, and the desire to identify and use innovative technologies to permit cost-effective remediation of the sites.

Regulatory developments

MGP sites, for the most part, have not been managed under federal environmental regulations. As of 1996, only nine of the 1500 to 2000 MGP sites had been placed on the National Priority List (NPL) of the USEPA and designated for management under CERCLA. These figures support the fact that observed releases and imminent environmental risks are not typically present at MGP sites. At the same time, the Resource Conservation and Recovery Act (RCRA) of the USEPA did not substantially affect MGP sites during the initial years of investigation. This was a result of the Bevill Amendment that excluded MGP site hydrocarbons from the definition of solid waste and, hence, from potential classification as a hazardous waste.

This exclusion was eliminated around the end of 1989, leaving MGP sites subject to selected requirements of RCRA. The most recent RCRA treatment requirements that are applicable to MGP site residuals are the Phase

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IV Land Disposal Restrictions (LDRs). The LDRs specify a level of treatment that must be achieved for all hazardous wastes at contaminated sites before the contaminated media can be sent to a landfill or other land-based disposal unit. These requirements will only affect those MGP sites where hazardous wastes are determined to be present. To date, hazardous wastes typically only represent 10 to 20 percent of the total wastes associated with MGP site remediation.

At the same time that the RCRA picture was developing for MGP sites, the USEPA began to consider the specification of presumptive remedies for the remediation of MGP sites. The prevailing thought was that due to the similarities among the operations of MGP sites, that is the use of underground tar separators, subsurface gas holder tanks, and underground tar wells, there should be set of site remedies that could be defined that would apply to most, if not all sites, without requiring significant regulatory review. This approach was soon abandoned when it became evident that the site-specific factors were too overwhelming and precluded the development of a one-size-fits-all, standardized set of remedies.

Many MGP sites do not require extensive, and in some cases any, remedial action. This is not because there is no contamination present on the site; rather, it is because there is limited or no exposure of the contaminants to ecological or human receptors.

The end result of the lack of applicable federal environmental regulations is that the majority of the MGP sites are being managed under the purview of the individual states. In many cases, the state programs that are most often used are risk-based, voluntary programs.

Financial developments

Cost recovery actions have also played a role in the management of MGP sites since every utility is obligated to recover as much of the site management costs as possible from either potentially responsible parties (PRPs) or insurance companies. Cost recovery actions of this type often influenced the schedule for the completion of site remedial action for a couple of reasons. First, cost recovery from PRPs required that the site management activities be conducted in substantial compliance with the National Contingency Plan (NCP) which was developed by USEPA for the management of Superfund sites. The NCP defines a rigorous process for site investigation, risk assessment and site remediation, which, when combined with the substantial reporting requirements, has the tendency to slow down the site management process. A recent report by the National Research Council (NRC) states that the average time between the proposal for listing a site on the NPL and construction of a cleanup remedy is 12 years. Similarly, at MGP sites where there was no imminent risk to the public health or the environment, the site management process was slowed for many utilities as they attempted to recover costs from insurance companies. These companies had sold the utilities' general liability policies during the operation of the plants. The technical and legal resources required by many utilities to prepare for the legal case to secure these monies often made it impossible for the company to maintain their technical field work and regulatory negotiations at the sites. This reduction in effort resulted in slower progress toward the closure of sites.

Technical developments

Even though presumptive remedies were not defined, there were technical developments that took place that had an impact on the management of MGP sites. For example, the Edison Electric Institute (EEI) developed a strategy document for the management of heavily contaminated organic residues and contaminated soils that exhibit hazardous characteristics. This strategy set forth procedures to render these residuals nonhazardous in onsite facilities, permitting their final disposition in a high efficiency combustion unit such as a utility boiler. The onsite processing procedures that were specified included the blending of the residual with agents such as coal or wood chips.

Other developments have been the recognition and acceptance of the natural attenuation on organic-contaminated groundwater. During the late 1980s and early 1990s, it became evident to environmental scientists that the remediation of contaminated groundwater using pump and treat systems was not an

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effective treatment strategy, especially when the source of the groundwater contamination could not be entirely removed.

The observations were being made by such organizations as the NRC as well as USEPA. In fact, the USEPA issued technical guidance in September 1993 for evaluating the technical impracticality of groundwater remediation in the presence of heavy hydrocarbons in the subsurface.

At the same time, the examination of organic-contaminated groundwater plumes at field sites revealed that there are instances where the actions of the natural environment resulted in the removal of organic contaminants from groundwater, providing that the rate of release of the contaminants from the source was sufficiently reduced as a result of the partial removal, treatment, or natural aging of the source in the environment. The occurrence of natural attenuation of contaminated groundwater at MGP sites has been documented at a site in New York and is being investigated at several sites in Georgia.

These developments are indicative of the types of technological innovations that have evolved since the presence of MGP sites was first recognized. Their evolution has provided MGP site managers with remedial options that were not available to them 10 years ago and that now allow for more cost-effective site management.

Evolution of the risk-based paradigm for MGP site management

Over the last several years, it has become increasingly evident that there are not enough technical and financial resources in the United States to remediate all contaminated sites to background concentrations or pristine conditions. The alternative is to focus the resources on the conditions that represent the greatest risk to human health and the environment. This approach is known as the risk-based approach to site management and is based upon the classic risk paradigm that states that the risk associated with a site is a product of the toxicity of the contaminants that are present and the exposure to receptors to these contaminants. As such, the management of the risk can be achieved by reducing either the toxicity or the exposure, or both.

Viewed from this perspective, many MGP sites do not require extensive, and in some cases any, remedial action. This is not because there is no contamination present on the site; rather , it is because there is limited or no exposure of the contaminants to ecological or human receptors. For example, at many MGP sites, the contaminants have not moved offsite even though they have been present onsite for tens of years. This observation is attributed to the nature of MGP site contaminants, their location on the sites, and their interactions with the soil and groundwater environment.

Most of the more concentrated hydrocarbon contamination is located in the subsurface environment where it is not accessible to ecological or human receptors and where it has become sequestered or bound to the soil, making only a portion of it available to the groundwater. The more mobile hydrocarbon contaminants may also have limited or not environmental impacts since these compounds can undergo natural attenuation in the surrounding environment following their release from the source material. As for the inorganic compounds, cyanide has demonstrated some mobility in groundwater; however, it exists as complex metal cyanides that are not toxic to human or ecological receptors.

Recognizing these aspects of MGP site contamination, it is understood that it is not necessary to achieve complete removal of the source to fully remediate the site. Rather, it is necessary to ensure that the risk at a site is managed using a combination of techniques that involve limited source removal and exposure management. For example, DNAPLs that have migrated to depth and sit on a geological confining layer may not be an issue since direct contact with human and ecological receptors is unlikely and contaminant release to groundwater may be sufficiently slow to be controlled by natural chemical and biological processes.

Similarly, the offsite movement of cyanide in MGP site groundwater may also not be an issue since the chemical species of cyanide that are present at MGP sites are dominated by the non-toxic, complexed metal cyanides.

What lies ahead?

Moving ahead with the risk-based management of MGP sites, it is envisioned that evaluations should not focus on the total concentration of soil-bound contaminants but in those fractions that are available and toxic to the receptors of concern. Of particular interest will be:

- Identification of complete exposure pathways for the receptors of concern;
- An assessment of the fraction of the contaminants that are available for uptake by the receptors and the form and toxicity of the available contaminants;
- The effect of treatment of the available fraction of the soil-bound contaminants, and;
- The effects of natural processes on the offsite movement of the available, onsite contaminants.

To apply this approach requires methods currently exist; others are just now being developed. As these methods are applied to MGP sites, it is believed that cost-effective remediation can be accomplished while still being protective of human health and environment.œ

Charbon Consultants

HCZyme

Abstract

HCZyme is a commercially available aqueous biostimulation agent composed of bacterial growth enhancing agents, extracellular enzymes and surfactants. HCZyme is designed to enhance the in situ bioremediation of numerous petroleum-based contaminants in soil and water by stimulating indigenous microbes to degrade them. Specifically, HCZyme produces the following results:

- Increases the number of petroleum-degrading microbes,

- Provides extracellular enzymes that initiate the breakdown of petroleum hydrocarbons, enhancing bioremediation,

- Maintains the microbial population so even low concentrations of

contaminant can be treated, and

- Contains surfactants to desorb petroleum from soil particles and to assist in moving petroleum and nutrients through the soil more easily.

HCZyme has been demonstrated in bench-scale tests and at field remediations to be effective on benzene, toluene, ethylene, and xylene (BTEX), PAH, trichloroethylene (TCE), dichloroethylene (DCE), mineral spirits, fuel oils, motor oils, and hydraulic fluids. The vendor claims that HCZyme has been tested and used on over two million tons of petroleum contaminated soils, and is effective in breaking down petroleum hydrocarbons, polychlorinated biphenyls (PCBs), creosote, sludges, waste oils, free product, tank bottoms, and other chlorinated compounds (D18208L, p. 15).

The major limitations of this technology are those factors that affect bacterial growth, including temperature, pH, and presence of other contaminants detrimental to bacteria life. Other factors that may affect speed and completion of contaminant breakdown include moisture level, soil properties and microbe mobility.

Charbon Consultants

HCZyme

Technology Description

1. Introduction

HCZyme is a commercially available aqueous biostimulation agent composed of bacterial growth enhancing agents, extracellular enzymes and surfactants. HCZyme is designed to enhance the in situ bioremediation of numerous petroleum-based contaminants in soil and water by stimulating indigenous microbes to degrade them. Specifically, HCZyme produces the following results:

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contaminant can be treated, and

- Contains surfactants to desorb petroleum from soil particles and to assist in moving petroleum and nutrients through the soil more easily (D115355, pg. 410; D15846X, pp. 4).

2. History and Stage of Development

HCZyme is a proprietary product developed by International Enzymes and marketed by Ecology Technologies, Inc. (ETI) under the trademarked name FyreZyme™, the manufacturing rights for the proprietary blend were purchased in October, 1996 by Charbon Consultants of Tustin, California. The technology is currently commercially available from Charbon Consultants as HCZyme. The technology has been applied under field conditions and in the laboratory since 1990. HCZyme has been used and tested under several different product names, including Bactozyme and FyreZyme™ (Personal Communication: Bret Braden, Charbon Consultants, April 1997; D115355, pg. 410; D15846X, p. 8).

HCZyme has been toxicity tested and shown to be safe to humans, wildlife, and the environment in intended field uses. A number of in situ field programs have been performed and are in progress to support HCZyme as a natural bioremediation solution. Currently, this technology is used in full-scale field demonstrations on petroleum-contaminated soils and in ground water (ex situ and in situ). Full-scale field trials have reported rapid reductions in petroleum contamination (D115355, pg. 410; D15846X. p. 8).

3. Process Description

There are many factors affecting the speed and completion of the breakdown of petroleum hydrocarbons in soil and water. The acceleration of the naturally occurring microorganic metabolic and enzyme production process is accomplished by creating an optimal environment and food source. The various components necessary to this process include: bacteria and bacterial mobility within the matrix; oxygen in sufficient quantity to support metabolism; moisture content control, temperature control; and pH control. Environmental factors must be continually monitored throughout the treatment process to create the optimal breakdown process (D15846X, p. 6).

While microbes are capable of utilizing petroleum hydrocarbons as an energy source, they generally prefer simple sugars (glucose) for rapid growth and energy. Other growth factors required by some microbes include amino acids, purines and pyrimidines. HCZyme works by providing these food sources for petroleum degrading microbes. Once customary food supplies are exhausted, microbes capable of degrading petroleum are favored and their numbers increase preferentially. Periodic application of HCZyme results in periods of microbial growth which is followed by periods of petroleum consumption by the microbial population. However, periodic application of HCZyme should also be followed by monitoring of oxygen, water and microbial activity (D15846X, p. 4).

HCZyme provides a mixture of extracellular enzymes capable of initiating and catalyzing the breakdown of a wide variety of petroleum hydrocarbons leading to enhanced biodegradation. Certain extracellular enzymes initiate the oxidation process for biodegradation of petroleum products. In the first step of such oxidation, these enzymes break off two-carbon units from saturated hydrocarbon chains (typical of most petroleum compounds). The transformed petroleum molecule is then released from the enzyme, allowing the enzyme to react with petroleum molecules. The two-carbon units from the breakdown of petroleum molecules are transferred into the microbe for its own metabolic use. The microbe then alters its own enzyme production to attack the contaminant directly as a food source (D15846X, p. 4)

HCZyme contains organic surfactants to desorb petroleum from soil particles. This allows the hydrocarbons to move more freely through the soil pores where less mobile microbes live. The surfactants break down macroscopic clumps of petroleum into smaller units which increase the surface area for biodegradation to take place (D15846X, p. 5).

To use HCZyme effectively, engineering studies must be performed in order to determine the proper application of HCZyme. Generally, however, HCZyme is provided in a concentrated form. One gallon (3.79 liters) of the concentrate is used to totally remediate approximately 8 cubic yards (6 cubic meters) of petroleum contaminated soil. If contamination is deep, and if conditions are anaerobic, a combination of HCZyme, oxygenated water and other sources of oxygen can be injected. A 6% solution of HCZyme (1 gallon or 3.79 liters, per 16 gallons or 61 liters of water), is applied to the contaminated soil in weekly applications. Between applications, the moisture level of the remediation bed is maintained at 60% to 80% field capacity (D15846X, pp. 6-7).

4. Involvement with Government Programs/Regulatory Acceptance

HCZyme has been approved by the EPA for use in surface water, ground water, and soil remediation (D158050, p. 34).

5. Performance

HCZyme has been demonstrated in bench-scale tests and at field remediations to be effective on benzene-toluene-ethyl-xylene (BTEX), PAH, trichloroethylene (TCE), dichloroethylene (DCE), mineral spirits, fuel oils, motor oils, and hydraulic fluids. Concentrations are reduced to below the regulatory levels (D115355, pg. 410-416). The vendor claims that HCZyme has been tested and used on over two million tons of petroleum contaminated soils, and is effective in breaking down petroleum hydrocarbons, polychlorinated biphenyls (PCBs). creosote, sludges, waste oils, free product, tank bottoms, and other chlorinated compounds (D158208L. p. 15).

Bench scale, full-scale, and pilot scale studies have been performed using the HCZyme technology to bioremediate soil impacted by oil company flare pits, service station disposal pits, leaking underground storage tanks, refineries, and chemical plants (D115355, pg. 411 to 413; D123615). Vendor-supplied performance data are summarized in Table 1.

6. Limitations

The major limitations of this technology are those factors that affect bacterial growth, including temperature, PH, and presence of other contaminants detrimental to bacteria life. Other factors that may affect speed and completion of contaminant breakdown include moisture level, soil properties and microbe mobility (D123615, Section II)

7. Feed Rate or Treatment Capacity

One gallon (3.79 liters) of the concentrate is used to totally remediate approximately 8 cubic yards (6 cubic meters) of petroleum contaminated soil. If contamination is deep in the soil to be remediated and if conditions are anaerobic, a combination of HCZyme oxygenated water and other sources of oxygen can be injected (D15846X, pp. 6-7).

8. Material Handling and Pretreatment

According to the vendor, the most time and cost effective method of treatment is to spread the contaminated media on the surface (ex situ) in single layer 14-inch lifts, allowing treatment under ideal aerobic conditions. When used in situ (where anaerobic conditions exist), injection wells, injection galleries or sparging systems must be engineered to take into account unique site-specific conditions (D15846X, p. 7).

HCZyme was subjected to toxicity tests which found that HCZyme is harmless to humans, animals, marine life and the environment. No special handling is required since HCZyme is non-hazardous and non-toxic to humans (D123615; D15846X, p. 8).

9. Process Waste Stream

No available information.

10. Operator Requirements

No available information.

11. Utility Requirements

No information available.

12. Set-Up/Tear-Down Requirements

No available information.

13. Technology Reliability/Maintainability

No available information.

14. Public Acceptance

No information available.

15. Information Sources

D123615, Ecology Technologies, Inc., Date Unknown

D115355, Meaders. 1994

D15846X, Charbon Consultants, Date Unknown

D158050, Braden & Ryckman, 1997

D18209M, Braden & Ryckman, 1997

D18210F, Remtech Engineers, 1997

D18208L, Pollution Engineering, 1997

Table 1. Summary of HCZyme Vendor-Supplied Quantitative Performance Data

Site and Soil Volume	Days	Contaminant	Initial Concentration	Final Concentration
Bench scale (gasoline in soil), 1 yd^3	21	TPH	72,000 ppm	56 ppm
		benzene	2,000,000 ppb	10 ppb
		ethylbenzene	15,000 ppb	10 ppb
		total xylenes	110,000 ppb	10 ppb
Oil company flare pit, 1 yd^3	21	TPH	60,000 ppm	400 ppm
		various PAHs	620 to 15,000 ppb	nondetectable
Closed service station, 30 yd^3	14	TPH	700 ppm	<10 ppm
Leaking underground storage tank, 400 yd^3	21	TPH	approximately 340 ppm	approximately 10 ppm
Chemical company blending site - two piles totaling 6,500 yd^3	14	TPH	approximately 1225 ppm	nondetectable
		perchloroethylene	approximately 200 ppb	nondetectable
		dichloroethylene	approximately 110 ppb	nondetectable

Adapted from D123615

yd^3 = cubic yard

ppm = parts per million

ppb = parts per billion

TPH = total petroleum hydrocarbons

PAHs = polycyclic aromatic hydrocarbons

Charbon Consultants

HCZyme

Technology Cost

One gallon of the HCZyme concentrate will clean about eight cubic yards of contaminated media, and cost $55 in 1997, or approximately $7 per cubic yard. This estimate does not include engineering and other associated costs such as excavation, permits and treatment of residuals. According to the vendor, chemical costs are approximately $7 per cubic yard, and total treatment costs range from approximately $15 to $50 per cubic yard (D15846X, pp. 6, 9; D18211G, p. 1).

Information Sources

D15846X, Charbon Consultants, Date Unknown

D18211G, Remtech Engineers, 1997

Charbon Consultants

HCZyme

Case Study Overview

Bench scale, full-scale, and pilot scale studies have been performed using HCZyme (formerly FyreZyme™ - see Section 2 of Technology Description) to remediate soil impacted by oil company flare pits, service station disposal pits, leaking underground storage tanks, refineries, and chemical plants. This technology has also been used to increase oil production by reducing paraffin build-up in oil wells (D18210F, p. 3).

Pilot-Scale: Petroleum Hydrocarbons

In a pilot-scale study, TPH levels were evaluated in barrels of sludge, soil, and water mix from a refinery site. One 200-liter barrel was opened and an amount of FyreZyme TM solution equal to 4% by volume of the barrel contents was applied. Then the barrel was recapped. An untreated, opened, then closed barrel was used as the control. After 60 days, TPH levels were measured in the treated barrel, Levels were reduced from 250,000 milligrams per kilogram to 3,500 milligrams per kilogram. In addition percent solids were reduced from 65 percent in the control barrel to about 15 percent in the treated barrel (D115355, pg. 414).

Full-Scale: Petroleum Hydrocarbons

One full-scale study conducted at a closed service station involved a disposal pit containing motor oil, hydraulic fluids, and brake fluid. A FyreZyme™ solution was applied on days 1 and 7. By the end of the 14th day, TPH dropped from 700 milligrams per kilogram to less than 10 milligrams per kilogram. A second full-scale study involved the excavation of a leaking underground storage tank. About 400 cubic yards (360 cubic meters) of soil were placed in lined berms 14 inches deep. FyreZyme™ solution was applied on days 1, 14, and 21. The bottom of the pit was used as the control. The levels of TPH, benzene, and xylene remained essentially the same in the control area, while levels in the treated area were below regulatory limits after 21 days (D115355, pp. 412, 413).

Full-Scale: Diesel Fuel

An estimated 227,000 liters of diesel fuel migrated through the soil and entered the ground water system through sinkholes following a pipeline break. Remtech Engineers of Marietta, Georgia was engaged to remediate approximately one-half hectare of sandy clay loam saturated with fuel from 1 to 2.5 meters in depth. Several technologies were evaluated, and HCZyme was selected as the most cost-effective alternative. A multi-layered horizontal aeration injection/extraction manifold was placed in the soil with an integrated water/enzyme application system to treat the soil in situ. The site was then covered with black plastic. Heated injection air was obtained from the heat of compression from regenerative blowers alternating between positive and negative pressure modes (D158050, pp. 35-36).

The preliminary site design calls for using the soil treatment system as an infiltration gallery for enzymes and water to treat vadose zone soils and attack trapped free product. Air and enzyme injection through an existing free product monitoring well network will accelerate bioremediation of the saturated zone. A three week pilot test was conducted an soil and ground water samples extracted from the site. After one week of treatment, heterotrophic populations in the soil increased fro 1,500,000 to 150,000,000 colony-forming units (CFU) per gram. Initial TPH concentrations in the soil dropped from 1,543 ppm to 562 ppm after two weeks, and to 280 ppm after three weeks of treatment. In the saturated zone, free product thickness was reduced from 72 millimeters (mm) to 9 mm after two weeks. Initial free product TPH concentrations were reduced from 1,028,000 ppm to 205,200 ppm after two weeks, to 40,600 ppm after three weeks of treatment (D158050, p. 36).

Pilot-Scale: Oilfield and Tar Seeps

From mid-1997 through mid- 1998, HCZyme was used in a five-acre pilot test as a bioremediation accellerant. Heavy crudes. tar seeps, oil wastes, and oilfield production wastes were degraded from over 70,000 ppm - C_{28+} to below 500 ppm in nine weeks. Lighter petroleum hydrocarbons (shorter chain, $<C_{28+}$) were completely destroyed. Full scale site remediation of the 600 acre site is scheduled to be implemented (D 18211 G, p. 9).

Full-Scale: Diesel Fuel

180 cubic yards of soil was contaminated by diesel fuel when a tractor trailer was wrecked. HCZyme was applied and tilled into the soil at five one week intervals. After five weeks, TPH was reduced from 4,183 ppm to less than 250 ppm. In a separate but similar incident, 80 cubic yards of soil was contaminated with diesel to 3, 100 pprn TPH. After five weeks of weekly HCZyme application and tilling, TPH was reduced to below 128 pprn (D 18211 G, p. 11).

Recent projects include: reduction of California tar seeps in soil from 80,000 ppm TPH to <500 ppm in 9 weeks; pipeline groundwater free product diesel TPH degradation from 1,028,000 ppm to <5 ppm in 79 days, and pipeline soil diesel TPH degradation from 1,543 ppm to 97 ppm in 50 days (D18211 G, p. 1).

Information Sources

D115355, R. H. Meaders, Date Unknown

D15805O, Braden& Ryckman, 1997

D18210F, Remtech Engineers, 1997

D18211G, Remtech Engineers, 1997

WORKSHOP ON PHYTOREMEDIATION OF ORGANIC CONTAMINANTS

Ramada Plaza Hotel
Fort Worth, Texas
December 18-19, 1996

WEDNESDAY, December 18, 1996

WELCOME AND BACKGROUND

Walter Kovalick, Jr., Director of the U.S. EPA's Technology Innovation Office (TIO), welcomed the participants and thanked them for attending. He explained that the goal of the meeting was to share information on current phytoremediation projects in the field and laboratory and to gauge attendees interest in further joint activities in the future. Kovalick said that the first scheduled speaker, Jim Matthews, Deputy Assistant Administrator for OSWER, had become ill and would not be able to attend. Kovalick assured the participants that EPA is dedicated to public-private partnering, which he described as a viable option for structuring future joint activities.

Kovalick noted that TIO monitors the use of innovative technologies at Superfund sites, and presented preliminary data summarizing the types of source control technologies selected for Superfund remedial actions through FY95. Established technologies, such as incineration and solidification/stabilization have been selected for 390 (57 percent) remedial actions. Innovative technologies have been selected for 300 (43 percent) remedial actions. Selected innovative technologies include soil vapor extraction, thermal desorption, *ex situ* bioremediation, *in situ* bioremediation, *in situ* flushing, soil washing, solvent extraction, and dechlorination. The most commonly selected innovative technologies were sod vapor extraction (selected 20 percent of the time), thermal desorption (selected seven percent of the time) and *ex situ* bioremediation (selected six percent of the time).

Kovalick also presented data summarizing the types of technologies selected for groundwater remediation through FY95. Pump-and-treat remedies were selected for 562 (93 percent) remedies. Pump-and-treat combined with an *in situ* treatment technology (for example, air sparging, bioremediation, and passive treatment walls) were selected for 32 (five percent) remedies. *In situ* treatment technologies without pump- and-treat were selected for only nine remedies.

Kovalick announced a soon-w-:be released publication from TIO entitled *Recent Developments for In Situ Treatment of Metal Contaminated Soils*. The publication will describe the use of electrokinetics, phytoremediation, soil flushing, and solidification/stabilization for remediating metals in soils. Kovalick invited participants to take copies of the TIO publications at the back of the room and to view demonstrations of TIO's Clean-Up Information (CLU-IN) World Wide Web site (http://clu-in.org), the Vendor Information System for Innovative Treatment Technologies (VISITT), and the Vendor Field Analytical and Characterization Technologies System (VendorFACTS).

Kovalick provided a brief history of the Remediation Technology Development Forum (RTDF). In 1992, Fortune 500 problem-site owners expressed an interest to EPA's Administrator in working with EPA and other federal agencies to identify solutions to complex remediation problems. Under the RTDF, groups with common interests and needs form "Action Teams." The mechanisms of the Action

Teams are custom tailored to the members' needs with the objective of identifying mutual needs in order to reach a common goal as quickly as possible. Action Teams have been formed to address organics and metals contamination in soils and groundwater. Operating RTDF Action Teams include the LasagnaTM Consortium (dealing with a new *in stiu* soils remediation process), Bioremediation of Chlorinated Solvents Consortium, Permeable Barriers Action Team In-Place Inactivation and Natural Ecological Restoration (IINERT) Soil-Metals

Action Team, and Sediments Remediation Action Team. Kovalick emphasized that EPA's role in these Action Teams is simply to empower others to work together.

Kovalick expressed his hope that the conference would result in agreements among participants for working together—as an RTDF Action Team or in another form—in addition to exchanging information on phytoremediation research, development, and demonstrations.

CONFERENCE OBJECTIVES

Phil Sayre (EPA Technology Innovative Office) thanked participants for attending and noted that there was a good turnout for the previous day's site visit to a Carswell Air Force Base phytoremediation project. Sayre said the first day of the meeting would be dedicated to getting participants caught up on others' work and the state-of-the-art in phytoremediation through presentations by participants. The second day, he explained, would be dedicated to working in groups to try to answer questions about how to advance the use of phytoremediation: 1) what are the key questions that need to be answered before phytoremediation can be used broadly; 2) how should these questions be attacked, for example, through research or regulatory changes; 3) who are the parties that can best answer the questions; and 4) what are the best mechanisms for communication between users and developers of phytoremediation technologies (for example, RTDF Action Teams, annual meetings, teleconferences, WWW sites, or validation of field testing). Sayre said that a summary of the conference, including a list of attendees' addresses, phone numbers, and e-mail addresses, will be distributed to participants.

REMEDIATION TECHNOLOGY DEVELOPMENT FORUM

Bill Berti (DuPont) described the history and operation of the Remediation Technology Development Forum. Berti noted that he co-chairs the IINERT Soil-Metals Action Team along with Jim Ryan from EPA's Cincinnati laboratory. The RTDF began in 1992 with a discussion between Monsanto and EPA on how to foster collaboration between government and industry, discuss common problems, and develop innovative solutions to difficult contamination problems. The RTDF was created to advance the development of mote permanent, cost-effective technologies for the remediation of hazardous wastes. Berti noted that RTDF members are free to form any type of alliance that brings members together to work on priority issues. Formal consortia can be formed where there is a need to protect proprietary information, workgroups can be formed to coordinate scientific programs and gain public acceptance for new technologies, and information sharing activities can be formed to periodically exchange information when interest is high.

Berti said that there are a number of advantages for businesses involved with the RTDF. The government shares costs, technologies, and expertise, and cooperates on addressing site-specific problems. Industry manages the projects, thereby providing "sweat equity." The RTDF can help shape national policy and develop better technologies through leveraging of national resources. EPA can help other government agencies, such as the Department of Energy, network with businesses.

An important lesson learned for RTDF participants is that there needs to be a sponsor—someone who has the problems to drive the program. There also needs to be substantial resources available. Technical and legal discussions should be conducted on parallel paths. It is a large leap from agreement in principle to final contractual language—no agreement is perfectly complete or protective. Working on public acceptance of new technologies is vital. If the right ingredients are in place, exceptional achievements are possible.

Berti then briefly described the IINERT technologies, which are intended to eliminate the hazards of metals in soils. IINERT technologies chemically and physically inactivate metals in soils by incorporating chemicals (phosphates, mineral fertilizers, limestone, and other materials) that change the molecular species of metals, thereby reducing their solubility and bioavailability. These changes may increase the fertility of soils, making plant cover an attractive option for stabilizing the soil. Before DuPont was willing to move forward with development of this technology, the company wanted to see a comparison of costs for various treatment technologies. Treating a 10-acre site with off-site solidification/stabilization would cost $12 million, treating with soil washing would cost $6 million, an asphalt cap would cost $650,000, a soil cap would cost $600,000, and IINERT would cost $250,000.

In response to a question about the role of the sponsor, Berti said a sponsor is needed to plan ahead and move the process along. Kovalick noted that Cooperative Research and Development Agreements (CRADAs) can be signed to allow federal laboratories to provide facilities and support. With government involvement in joint partnerships, businesses also avoid potential anti-trust issues from their joint meetings.

PHYTOREMEDIATION OF ORGANIC COMPOUNDS: MECHANISMS OF ACTION AND TARGET CONTAMINANTS

Steve Rock (EPA National Risk Management Research Laboratory in Cincinnati, Ohio) said that most of the people working on phytoremediation are present at the conference. Phytoremediation is defined as a set of processes that use plants to clean contamination in soil, groundwater, surface water, sediment, and air. The goals of phytoremediation research are to answer questions about the technology’s ability to lower contaminant concentrations and its mechanisms of action. The questions to be addressed differ depending on the specific media and contaminants.

Mechanisms of phytoremediation include enhanced rhizosphere biodegradation, phytoextraction, phytodegradation, and volatilization. Enhanced rhizosphere biodegradation takes place in the soil surrounding plant roots. Natural substances released by plant roots supply nutrients to microorganisms, which enhances their ability to biodegrade hazardous materials. Plant roots also loosen the soil and then die, leaving paths for transport of water and aeration. This process tends to pull water to the surface zone and dry the lower saturated zones.

Phytoextraction is the uptake of contaminants by plant roots and the translocation of contaminants into plant shoots and leaves. Where contaminants are stored in plant shoots and leaves, the plants can be harvested and disposed of. Some plant species have demonstrated the ability to store metals in roots. Although roots generally cannot be harvested in a natural environment, a process called rhizofiltration can be used where plants are raised in greenhouses and transplanted to sites to filter metals from wastewaters. As the roots become saturated with metal contaminants, they then can be harvested and disposed of Plants also have been used to concentrate radionuclides in the Ukraine and

Ashtabula, Ohio.

Phytodegradation is the metabolism of contaminants within plant tissues. Plants produce enzymes, such as dehalogenase and oxygenase, that help catalyze degradation.

Physical effects include volatilization, which occurs as plants take up water containing organic contaminants and release the contaminants into the air through plant leaves. Researchers are not sure how much contamination is being transpired into the air. Data on transpiration is still at a preliminary stage, The Cincinnati laboratory is building chambers to monitor the amount of organic contaminants released into the air. Another physical effect of phytoremediation is the hydraulic control of contaminated plumes that can be exerted by trees. Poplars, cottonwoods, and willows, can use up to 200 gallons of water per day and prevent contaminated plumes from flowing past tree roots.

Phytoremediation can be used as a polishing step after the removal of contaminant hot spots for widespread, shallow to medium-depth contamination. The advantages of phytoremediation are: 1) it is *in situ*, 2) passive, and solar driven; 3) costs only 10 to 20 percent of mechanical treatments; 4) is faster than natural attenuation; and 5) has high public acceptance. Phytoremediation has been selected as part of the remediation process at at least one Superfund site and several private sites; however, most of the field work using phytoremediation is at the testing and demonstration stage. The EPA Cincinnati laboratory currently is compiling information on phytoremediation and intends to provide guidance in five years on how to use the technology.

In response to a question on whether transpiration of organic contaminants has been documented, Jerry Schnoor (University of Iowa) said that transpiration has been documented in the laboratory, but no one is sure to what degree this happens in the field.

PHYTOREMEDIATION OF ORGANIC COMPOUNDS: VALIDATION APPROACHES FOR FIELD TESTING AND RESEARCH NEEDS

Steve McCutcheon (National Exposure Research Laboratory in Athens, Georgia) presented an overview of the benefits and limitations of phytoremediation and described research and research gaps related to phytodegradation. McCutcheon described seven areas where phytorernediation is being investigated for environmental management: 1) phytoaccumulation of metals and organics; 2) rhizofiltration of metals and organics from streams and wastewaters; 3) phytodegradation of organics; 4) phytovolatilization of selenium, mercury, and volatile organics; 5) control of leaching from landfills, 6) microbial stimulation in the rhizosphere; and 7) removal of organics from the air. Some of the benefits of using plants are that they are aesthetically pleasing, control water balance, have highly evolved enzyme systems, can be self- sustaining in nutrients, can achieve complete breakdown of hazardous materials, and are relatively inexpensive.

McCutcheon noted that there are a number of limitations to phytoremediation:

- It is limited to shallow soils, streams, and groundwater.
- Might concentrations of hazardous materials can be toxic to plants.
- It involves the same mass transfer limitations as other biotreatments.
- It is slower than other treatments, particularly in cold weather.
- It can transfer contamination across media.
- It is not effective for strongly sorbed (*e.g.*, PCBs) and weakly sorbed contaminants.
- The toxicity and bioavailability of biodegradation products is not always known.

- Products may be mobilized into groundwater or bioaccumulated in animals.
- It is still on the frontier of science.
- It is unfamiliar to regulators.

McCutcheon said that EPA's Athens laboratory has developed monoclonal antibodies for at least one of the following three plant enzymes involved in phytoremediation nitroreductases, dehalogenases, and nitrilase. These antibodies allow one to identify plants that produce these enzymes. Other research conducted by the laboratory includes investigating the pathways of compound degradation and comparing munitions degradation by vascular plants and microorganisms. Plant enzymes can degrade explosives, solvents, nitriles, pesticides, and phenols. Plant enzymes useful for engineering applications include nitroreductases for munitions remediation, dehalogenases for degradation of chlorinated compounds, nitrilase for herbicide treatments, phosphatases (which have not yet been isolated) for treatment of organophosphates, lactase for the oxidative step in munitions degradation, and peroxidase for the destruction of phenols. The Athens laboratory also has worked with the Army on field demonstrations of phytoremediation of munitions at the Iowa Army Ammunition Plant, Volunteer Army Ammunition Plant, and Milan Army Ammunition Plant.

In summary, McCutcheon said that using natural plant processes for phytoremediation is effective for some compounds. However, rigorous science and engineering are required to demonstrate the effectiveness of phytoremediation at particular sites. Mass balances and pathway analysis are the keys to proving the applicability of phytoremediation. In addition, the toxicity and bioavailability of specific compounds must be defined.

PANEL DISCUSSION ON THE USE OF PHYTOREMEDIATION TO CLEAN UP PETROLEUM HYDROCARBON SPILLS

Phil Sayre, the moderator for the Panel Discussion on the Use of Phytoremediation to Clean Up Petroleum Hydrocarbon Spills, introduced the panelists: Dr. Evelyn Drake, Exxon; Dr. Sheldon Nelson, Chevron; and Dr. Alonzo Lawrence, Gas Research Institute.

Phytoremediation of Petroleum Hydrocarbons

Evelyn Drake (Exxon) described her company's research on the biorernediation of aged hydrocarbons in surface soils. Bioremediation can be difficult because of complex soil matrices and the fact that hydrocarbon contaminants are partitioned into solid, water, and air phases of the soil. Despite this complexity, biorernediation works, Exxon is looking into the factors that effect the rate and extent of remediation, including the specific compounds, soil type, moisture level, microorganisms, oxygen availability, nutrient type and amount, temperature, and sod pH. They have found that inoculating soils with special microorganisms is more effective at degrading TPHs than stimulating naturally occurring microorganisms with nutrients.

Exxon has conducted laboratory studies of PAH biodegradability in aged refinery soil. Researchers have investigated the typical composition of aged refining hydrocarbons, and found that many of the more toxic compounds were soluble enough to be affected by plants, while the total petroleum hydrocarbon concentrations in soils may not be lowered beyond a certain point by phytoremediation. The removal of PAHs is strongly affected by the amount of nutrients added, although nutrient levels can be increased to the point of being toxic to microorganisms. More nutrients must be added in a bioremediation application, such as landfarming, as compared to a phytoremediation application.

Exxon is a member of the Petroleum Environmental Research Forum (PERF), a consortium of 10 companies that contributed $142,000 to conduct laboratory studies of phytoremediation of hydrocarbons. The laboratory study compared biodegradation of soils contaminated with aged crude oil and gas plant sludge using phytoremediation, surface tilling, and a control. This study is being completed, but the specific results cannot be disclosed at this point. In general, the addition of plants to a biodegradation system appears to increase degradation rates. Also, the cost of phytoremediation is about half that of microbial bioremediation.

Phytoremediation is a promising technology because of its low cost, low impact, visual attractiveness, ability to reduce contaminant levels to same levels achieved by bioremediation and tilling, and opportunities for plant breeding and genetic engineering. The limitations of phytoremediation are that contamination must be shallow, the site must be a large enough to apply agronomic techniques, there must be sufficient remedial time, and its effectiveness is affected by contaminant variability, weather variability, animal and insect damage, and the presence of toxic chemicals and salt. Drake emphasized that mechanisms of action need to be studied to differentiate between microbial and plant effects.

In response to a question from Steve McCutcheon, Drake said that the PERF consortium is a group of petroleum companies that have been meeting regularly since 1990. Wait Kovalick noted that the consortium was created under provisions of a 1996 statute, which allows companies to conduct joint research projects and avoid potential anti-trust issues. He then noted that research results, such as those for phytoremediation projects, are not readily made available to the public. However, Amoco has created a PERF Home Page (http://perf.vs.com) that describes its environmental research projects.

Use of Trees for Hydraulic Control of Groundwater Plumes

Sheldon Nelson (Chevron) described a field research project in Ogden, Utah, being conducted to study the ability of poplars to act as a hydraulic barrier to solute transport in groundwater. Soils at the site are of low permeability, and the weather is good for transpiration. Gasoline and diesel components are dissolved in the groundwater, which is eight feet below the surface. Three rows of poplars were planted six feet apart and perpendicular to the groundwater flow. A lot of effort was exerted to make sure the tree roots reached the groundwater. Monitoring wells were installed upgradient, within, and downgradient of the trees.

Even though the trees were very young, having been planted in 1995 and 1996, it appeared that the trees were lowering the water level by 11/2 to 2 inches. Using simple geohydrological calculations and treating the trees like low-flow pumping wells, Nelson calculated that the trees were using 13 gallons of water per day per tree. He then calculated the pumping rate required to achieve hydraulic control of the groundwater at the site, and estimated a pumping rate of 25-30 gallons of water per day per tree. The conclusion is that it would theoretically be possible to use trees to contain groundwater at the Ogden site. Ari Ferro (Phytokinetics) said that a summer uptake rate of 40 gallons per day has been calculated for a five-year-old poplar,

Gas Research Institute Projects

Alonzo Lawrence (Gas Research Institute, Chicago) said that he was standing in for Tom Hayes, who manages GRI’s waste program. Lawrence said that there are 260,000 gas wells in the contiguous United States; 40,000 of which have produced water pits from glycol dehydrations, There also are 700 gas processing plants in the country. GRI is interested in remediation techniques for BTEX alkanes, amines, glycols, and other chemicals used to treat natural gas. They are investigating bioventing, land farming, and, more recently, phytoremediation. GRI will soon be starting an Environmentally Acceptable Endpoints Project to study the mobility of petroleum hydrocarbons in soils. Another project that soon will be starting is a Manufactured Gas Plant Remediation Project to investigate remedial technologies for phenols, PAHs, and cyanides that could be present at the country's 1,5002,000 coal gasification plants. Lawrence noted that GRI also contributed money and helped manage the PERF consortium's research project.

PANEL DISCUSSION ON THE USE OF PHYTOREMEDIATION TO CLEAN UP PESTICIDES, WOOD PRESERVATIVES, CHLORINATED SOLVENTS, MUNITION WASTE, AND MIXED WASTE

Bob Olexsey (EPA National Risk Management Research Laboratory in Cincinnati, Ohio), the moderator for the Panel Discussion on the Use of Phytoremediation to Clean Up Pesticides, Wood Preservatives, Chlorinated Solvents, Munition Waste, and Mixed Waste, introduced the panelists: Dick Woodward, Sierra Environmental Services, Inc., John Fletcher, University of Oklahoma; Joan Brackin, Monsanto, Tom Wong, Union Carbide Corporation, James Duffy, Occidental Chemical Corporation; Tom White, Ciba-Geigy, Greg Harvey, Air Force; and Terry McIntyre, Environment Canada,

Passive Gradient Control

Dick Woodward (Sierra Environmental Services, Inc.) said that he was standing in for Dick Sloan (Arco Chemical Co.). He discussed the use of plants to maintain passive gradient control for postclosure at the French Limited Superfund site in Florida. Objectives of the project were to use non-riparian phreatophytes to maintain an inward groundwater gradient toward the center of a former disposal lagoon area. Woodward explained that non-riparian phreatophytes are water loving plants that frequently have deep roots to absorb water from the capillary fringe zone of the phreatic surface (water table). This would avoid the migration of contaminants into surrounding aquifers and enhance natural flushing and intrinsic bioremediation.

Conditions that impact phreatophytes at the French Limited site include high temperature and humidity (which lower transpiration rates), brackish water, a water table 20-25 feet below the surface, and DNAPLs, Underground utilities, wells, and compact back fill divert tree roots and result in differential growth. There is a significant volume of low-level contaminated groundwater with low migration rates and low remediation rates. Run-off and run-on are controlled. Bioremediation is the selected remedy for the lagoon.

For the study, a number of phreatophytes were evaluated to identify species that would use 200-800 gallons of water per day and are suited to the conditions at the French Limited site. Alders, ash, aspen, river birch, and poplar all grow fast but have a low salt tolerance. Cottonwoods and willows have shallow roots. Mesquite and salt cedar tolerate salt but are difficult to control. Bald cypress prefers hot humid climates but its roots form knees. Eucalyptus grows very fast but has a low cold tolerance and is disease prone. Greasewood prefers cold or dry climates, Woodward emphasized that conducting a plant species evaluation early in a phytoremediation project is critical.

Phase 1 of the project included planting and watering bald cypress and river birch. Results were poor primarily because of salt impacts. Therefore, a second phase was implemented the following year using a wider variety of plants. A specific planting cycle was instituted and a drip irrigation system was installed to help establish the plants and encourage deeper root growth. Phase 2 efforts resulted in establishment of an inward gradient. Good control of the groundwater gradient was established during the growing season, but control was poor when the trees dropped their leaves.

The advantages of using phytoremediation were that hydraulic control was established, channeling could be avoided, clay soils were loosened, costs are low, and it is synergistic with the site closure plan. Woodward noted that a plant breeding program is needed to develop specific species. Desired characteristics include frost hardiness, fast growth, deep feeder roots, upright growth habit, salt tolerance, chemical tolerance, disease and insect resistance, and an ability to grow on poor alkaline soils. In addition, the plants should be native to a particular area, evergreen for winter control, and available from local vendors.

Walt Kovalick asked what would be done to maintain control after the growing season ends. Woodward said they are looking for broad leaf evergreens, such as water oak. Sheldon Nelson asked how the salt tolerance problem was addressed. Woodward replied that they initially used a deeper water source to get the plants established.

Summary of Screening Studies

John Fletcher (University of Oklahoma) summarized plant screening studies conducted by the University, The work was started with the perspective that there are bacteria that degrade PCBs using biphenyl as a cometabolite. They looked for naturally occurring substances produced by plants that could replace biphenyl as the cometabolite. Some flavonoid, coumarin, and other compounds were discovered that could serve as a substrate. They then looked for plant species that synthesize these compounds in large enough amounts to help degrade PCB. Seventeen perennial plant species grown throughout the country were evaluated. The three most promising species were crabapple, osage orange, and mulberry. The compounds are released at the end of the growing season, which is consistent with the time of death of some roots. Root death is an important factor because it provides channels in the soil and releases flavonoids, coumarins, and other compounds.

Fletcher noted that most of these species ran benefit from the sugars and amino acids released by most plants. A single gram of soil contains 10,000 different bacterial species. The challenge is to develop plant species that release compounds that promote the PCB degraders over the other 10,000 bacterial species.

Fletcher said that computer imaging technology was developed to simulate root growth and death. In nature, 1-5 percent of the soil is roots; 30 percent of these are fine roots. One percent of the total soil volume is in contact with dying fine roots. If the rhizosphere is included, seven percent of the total soil volume is affected. In order to affect the total soil volume using phytorernediation, you would need a 15-20 year project. To study this process, a contaminated site with estabfished vegetation could be examined. The rate of phytoremediation could be increased by using an electromagnetic field to move water containing contaminants back and forth through the same rhizosphere, and therefore expand the zone of influence of the rhizosphere.

Overview of Lasagna Technology

Joan Brackin (Monsanto) said that Monsanto is forming a new life science company that will look at phytoremediation. Monsanto has potential field sites and will investigate the feasibility of coupling phytoremediation with their LasagnaTM technology. The LasagnaTM process combines electroosmosis with treatment zones that are installed directly in contaminated soils to form an integrated *in situ* remedial process. Contaminants within pare waters are moved into the treatment zones with an electromagnetic field. The process can be used to move groundwater into plant root zones. By reversing polarity, groundwater can be moved back and forth through the root zone. In response to a question from Evelyn Drake, Brackin said that the range of water movement is about one centimeter per day. In response to another question, Brackin said that the process works best in saturated conditions, but water can be moved into the vadose zone to some extent.

The Living Cap

Tom Wong (Union Carbide Corporation) described a waste impoundment site that illustrates the concept of a "living cap," or use of plants to remediate a site and provide a closure pathway for the site. The one- acre facility includes four former impoundments, one of which (Basin 6) was drained of water 20 years ago exposing highly toxic sludge with the consistency of axle grease that contained PAHs and other mixed waste, Basin 6 now supports a diverse plant community, including grasses, shrubs, and a 65-75 percent tree cover, including mulberry and hackberry. Wong noted that mulberry is not a common plant in the area and that the closest mulberry tree is a half mile away from the site. In fact, he believes that plant to be the seed source for the mulberry trees growing on the site. The oldest of the mulberry trees germinated 18 years ago, only two years after the impoundment was drained. Wong noted that mulberries release flavonoids and coumarins that support PAH degrading bacteria

A portion of Basin 6 was excavated to a depth of 40 inches. The upper two to three feet of sludge in Basin 6 looks like top soil and has no chemical odor. The vegetation has dewatered the upper zone and strengthened and stabilized the sludge to the point that it could support a drill rig. Roots penetrated to a depth of two to three feet. There is a strong demarcation between the upper layers and the deeper sludge, which was saturated with water. Analysis of samples down to three feet found high concentrations of PAHs (with concentrations increasing with depth), according to the EPA Appendix 9 procedures. However, TCLP analysis showed nondetectable levels of PAHs in the same soils. Gas chromatography showed a very low number of PAH peaks at shallow soil depths.

Advantages of the living cap concept are: sludge can be converted to soil; evapotranspiration minimizes water infiltration through sludge; vegetation minimizes exposure to contaminants; the plants are aesthetically pleasing and self sustaining; and the toxicity and mobility of contaminants are reduced. A living cap does as well or better than a clay cap in preventing infiltration of rainwater. In addition, run-off from a living cap does not have to be treated as you would have to with a clay cap The cost of a living cap is often less than a conventional cap.

In response to a question from Evelyn Drake, Tom Wong said that nothing was planted at the site and no nutrients were added. In response to other questions, Wong said that they have not analyzed samples from the deeper sludge and the plants have not been analyzed to determine contaminant concentrations. Evelyn Drake said that Exxon has a similar site in New Jersey, where golden rod and phragmites are growing Into a contaminated area from the edges. The plants have lowered contaminant concentrations at the edges by a factor of five to ten. Jerry Schnoor said that vegetation caps have been approved by RCRA in lieu of a RCRA cap because studies have shown that seepage through the vegetation is less than through a conventional cap. He noted one capped 13-acre site as an example.

Field Experiment Using Poplar Trees to Treat Tricbloroethylene

James Duffy (Occidental Chemical Corporation) described a field experiment to investigate remediation of TCE contaminated groundwater by poplars. Phytoremediation is being considered primarily for non-active sites where the time for remediation is not critical. Early laboratory experimentation showed that poplars will take up TCE and can tolerate reasonable levels of the contaminant. Occidental received permission by the State of Washington to conduct field experiments using introduced TCE.

A two-year controlled field experiment to evaluate the uptake, metabolism, and transfer of TCE from groundwater by hybrid poplars was completed in November, 1996. Four meter by six meter cells were constructed to a depth of 1½ meters and lined with a double wall polyethylene liner. Sand and gravel were placed in the bottom of the cells, which were then filled with soils native to the site. Water was injected into the cells at a rate to maintain a residence time of one week. Once established, the plants were exposed to 15 ppm concentrations of TCE and extracted water was analyzed. Data from the second year shows that 65-70 percent of the introduced TCE was recovered from control cells that did not contain trees but very little TCE was recovered from the cells with trees. Bag and FTIR measurements of air samples found negligible transpiration of TCE in the second year of growth. Continuing activities include analyzing the trees, deten-nining the fate of the TCE, and verifying laboratory experiments. Analysis of data from the field experiment will be completed in three to five months.

Steve McCutcheon noted that a laboratory mass balance study showed high transpiration of TCE by poplars. Duffy said that the field experiment could have been designed better to determine mass balances. In response to a question about evidence of chloroform and vinyl chloride production, Duffy said that small amounts of vinyl chloride were detected.

Phytorernediation of Contaminated Sites

Tom White (Ciba-Geigy) said that Ciba-Geigy may have an interest in applying phytoremediation to cleanup their sites, they are currently evaluating several candidate technologies for their utility. White then described three contaminated sites that could be candidates for phytoremediation. The first site, Tom's River, is contaminated with chlorinated and non-chlorinated solvents in the vadose and saturated zones. Specific contaminants include TCE, toluene, anthracene, and naphthalene. A pump-and-treat system is in place, with packed carbon treatment and discharge to surface waters. It is a CERCLA site with northern and southern groundwater plumes. Depth to groundwater is 10 feet, The subsurface is sandy with clay stringers that may contain perched groundwater and DNAPLs. Researchers are looking at 1-15 years of active *in situ* bioremediation, followed by semi-passive remediation, then intrinsic remediation.

The MacIntosh, Alabama, site is located in a flood plain that is contaminated with pesticides, including DDT. It is a 10-15 acre CERCLA site with surface contamination over a large area. Portions of the site are forested with bald cypress, but there are other portions that are flooded in the winter with no vegetation. Contaminant concentrations do not exceed 1,000 ppm, and the DDT is bioavailable.

Another site in Elkton, Maryland, is a RCRA site contaminated with pesticides. Pesticide formulation at the site resulted in contamination of the top 18 inches of soils with DDT, toxaphene, and lindane at levels of approximately 50 ppm. When the facility was in operation, the site was primarily clear fields. It is now covered with trees and shrubs and seems to be an ideal site for phytoremediation.

Problems with using phytoremediation at these sites include bioavailability of residuals that are not leachable, the ultimate fate of residues, limitations on VOC releases, cleanup levels, and where the point of compliance takes place. If the point of compliance is the source area rather than discharge to surface water, phytoremediation probably will not be feasible. White said that there are numerous opportunities for research, including bioavailability, semi-analytical models, and phytoremediation process development.

Demonstration of Remediation of Shallow TCE using Cottonwood Trees

Greg Harvey (U.S. Air Force) said that the Air Force is conducting a field study to demonstrate whether planted eastern cottonwood trees can help remediate shallow TCE-contaminated groundwater. Air Force Bases typically have an enormous extent of TCE contaminated groundwater plumes, and cottonwoods are found throughout the world. The best niche for phytoremediation is between bioventing and intrinsic bioremediation. The Air Force has established a Technical Advisory Committee to help direct phytoremediation demonstrations.

A phytoremediation demonstration is being conducted at the Naval Air Station in Fort Worth, Texas, where there are good conditions for plant growth. The Base is underlain by a shallow, thin aerobic aquifer, with a depth to groundwater of 6-10 feet, Impermeable bedrock is beneath the aquifer. Rows of cottonwood trees have been planted perpendicular to groundwater flow to intercept a TCE plume Up- gradient controls and 20 monitoring wells up- and down-gradient have been installed. They are looking to see how fast the tree roots reach the water table. Phytoremediation could be cost effective if the roots grow fast. During a drought year, liberal irrigation was used to keep the trees alive. So far, the trees have grown very fast. The Air Force plans to analyze TCE, vinyl chloride, and haloacetic acids to see how concentrations change over time.

John Fletcher asked whether existing trees would be monitored, and Harvey said that they will be looking at enzymes and other factors in existing trees. In response to a question about the rate of natural attenuation at the site, Harvey said they have found some biodegradation by bacteria.

Canadian Experience with Phytoremediation

Terry McIntyre (Environment Canada) said that he is excited about the potential for phytoremediation as an innovative environmental solution for recalcitrant compounds, heavy metals, and radionuclides. The estimated cost for toxic metal reduction in Canada is $6 billion, and in the United States is $35 billion just for heavy metals. Environment Canada conducted a series of focus group meetings to gauge the awareness and support for phytoremediation by the public. Preliminary data show a public support rate of 82 percent. There probably is a similar level of support for phytoremediation in the United States—people understand plants. McIntyre cautioned that the public must be kept informed as work on phytoremediation moves forward.

The advantages of using trees for remediation are that they can create effective barriers, require low levels of maintenance, are inexpensive, and can be used at many sites simultaneously. Limitations of phytoremediation include a slower growth period, nutrient and water requirements, and a need for more research. Tree species being considered by Environment Canada include alder, hybrid poplar, black locus, sweetgum, loblolly pine, and juniper,

Environment Canada has developed a preliminary research strategy, and will convene a group of scientists from Environment Canada, other government agencies, and the private sector in February. Five major areas of research have been identified, including mechanisms of uptake, transport, and accumulation; genetic evaluation of hyperaccumulators, rhizosphere interactions; field validation and evaluation and clarification of regulatory oversight. Other research needs are determining how selective plants are and what to do with mixed wastes. There is a lot of enthusiasm in Canada's government agencies and a lot of valuable information already is available.

PANEL DISCUSSION ON SUCCESSES AND BARRIERS TO COMMERCIALIZING PHYTOREMEDIATION

Steve Rock, the moderator for the Panel Discussion on Successes and Barriers to Commercializing Phytoremediation, introduced the panelists: Dr. Jerald Schnoor, University of Iowa, Dr. Kathy Banks, Kansas State University; Dr. Ari Ferro, Phytokinetics; and Dr. Paul Thomas, Thomas Consultants.

Research at the University of Iowa/Limitations to Phytoremediation

Jerry Schnoor (University of Iowa) began his presentation by posing questions that regulators ask most often before allowing phytoremediation to be used at a site:

- What are the ultimate end-products?
- Are the chemicals volatilized?
- Have we created a toxic product in the vegetation?
- Is the site toxic to vegetation?
- Does phytoremediation work in the lab, greenhouse, and, most importantly, the field?

Schnoor then noted that due to underbudgeting at voluntary cleanup sites, efficacy and mass balance have not been demonstrated very well in the field. He added that it is difficult in some cases to predict which contaminants will be taken up by plants. The rule of thumb is that those with a log Kow of one to three can be taken up. However, some chemicals with a log Kow of 0.2 are absorbed by plants.

Next, Schnoor discussed phytoremediation lab studies that have been conducted at the University of Iowa. The. first study was a reproduction of a Brigg's (1982) plot where phytoremediation was used to address approximately 20 contaminants. Some of the contaminants—atrazine, alachlor, TCE, BTEX, chlorobenzene, benzo(a)pyrene, BEHP, chlordane, nitrobenzene, aniline, TNT, RDX, and 1,4-dioxane—were examined for uptake, volatilization, and soil mineralization. Analysis has shown that innocuous end-products have been found using 14C-compounds for atrazine and TCE in vegetables and poplars. Tests in the Midwest on atrazine showed that 138 ppm soil concentrations were decreased to 20 ppm atrazine after two growing seasons, with atrazine ring cleavage products detected within 80 days (results soon to be published in*Environmental Science and Technoloy*). In Iowa, an ammunition plant had soils contaminated with TNT. During phytoremediation of this site, some of the RDX was translocated into leaf tissue, while TNT was not translocated, but degraded in the root zone.

University of Iowa researchers have teamed up with consultants who have expertise in design, irrigation techniques, and tree planting to further their work in the area of phytoremediation. Both pilot- and full- scale demonstrations have been performed for pesticides, nutrients, TNT, and RDX (in process), BTEX, and TCE contaminated soils.

Schnoor next discussed the limitations of phytoremediation technology. He explained that phytoremediation is most applicable at shallow contaminated sites with moderately hydrophobic contaminants. He then noted that it is difficult to establish vigorously growing vegetation at many sites due to soil contamination, especially from metals. In addition, damage to vegetation from deer browsing, voles, beavers, damaging frosts, and disease, should be considered before choosing phytoremediation as part of a cleanup decision. Schnoor then noted that in order for phytoremediation to be successful as a commercial technology, fate studies need to be performed in the lab and greenhouse to understand entry into the environment of parent compounds and metabolites.

Schnoor then presented the group with a list of the research needs that should be identified before phytoremediation can be considered a successful technology:

- Long-term field studies to show the presumed efficacy of phytoremediation (some historical sites "remediated" with phytoremediation could be candidate sites for post audits).
- Screening test methods for determining the optimum plant species for each site.
- Models for fate and transport of soil and groundwater contaminants under the influence of phytoremediation (the HFLP, PRZM, and EPIC models have been utilized but were not developed for phytoremediation applications so new models developed specifically for phytoremediation would be helpful),
- A better understanding of the ecology of the system, such as myccorhizae, bacteria, and plant interrelationships and functions.
- Transgenic plants for potential future applications.
- The ability to degrade common contaminants, such as TCE and BTEX
- More feeding studies to determine the bioavailability and toxicity of contaminant metabolites in the soil following phytoremediation,

Phytoremediation Work in Cooperation with EPA's Region 7/8 Hazardous Waste Substance Center (HSRC and Two Industry Partners

Kathy Banks (Kansas State University) discussed phytoremediation work she has been conducting in cooperation with EPA's Region 7/8 Hazardous Substance Research Center (HSRC) and two industry partners. The first site she described was a Gulf Coast site that is contaminated with crude oil that has leaked into an agricultural area. Here, plots have been seeded and overseeded with rye and St. Augustine. grasses, and sorghum. After 21 months, researchers were able to determine enhanced microbial activity on the vegetated plots, which appeared to result in TPH degradation. In addition, they found that the rye and St. Augustine grasses performed better than the sorghum and the unvegetated control plot. Banks noted that this may have occurred because rye and St. Augustine roots are more fibrous than sorghum roots and provide more surface area for microbial activity.

Banks next described her work at an old refinery site contaminated with petroleum hydrocarbons on the West Coast. Here, plots include an unvegetated control, a tall fescue plot, a native California fescue plot, and a grass and legume mixture plot. Preliminary results indicate that the mixed species plot at this site appears to be more effective at remediating the contamination than the single species plots.

A new research project began last summer at a naval facility in Norfolk, VA, where bioremediation cells are being used to implement phytoremediation. The species used at this site include Bermuda grass with annual rye, tall fescue, and white clover. Researchers are hopeful that phytoremediation will work at this site because of the significant growth they have already seen in the plants and observed TPH degradation. However, only time will tell the extent of the technologys effectiveness at this site.

Banks then presented the group with some conclusions she has been able to make from her research.

- The rate of degradation depends on plant species.
- Optimization of fertilization is an important issue.
- Optimization of irrigation techniques to spread roots is crucial.
- Degradation rates in mixtures of contaminants need to be determined.
- Microorganisms appear to degrade compounds.
- BIOLOGK analyses of microorganisms associated with plants showed a higher microbial diversity associated with the rhizospheres of plants that degraded petroleum most efficiently.

Phytokinetics, Inc./SITE Program Project

Ari Feffo (Phytokinetics, Inc.) discussed a phytoremediation project to remediate soils containing 75-400 pprn PCP and PAHs at an old wood preserving site in Portland, OR. This project was the first phytoremediation technology accepted into EPA's SITE Program.

The project was conducted in two phases—a greenhouse study (Phase 1) and a small field-scale study (Phase II)—to compare the rates of contaminant removal in both planted and unplanted samples. For Phase I, soil samples, which were very acidic and only had the basic level of nutrients, were collected from the McCormick & Baxter Superfund site where significant PCP and PAH contamination exists. These samples were then put into four columns: two planted with perennial rye grass and two unplanted. Data shows that the nutrient status remained the same in the four treatments, but contaminant removal rates increased in the planted samples. Phase II was conducted at a small plot on the McCormick & Baxter Superfund site. Here, four plots-two unplanted and two planted with perennial rye grass-were developed in a 50 x 50 foot area where there was light PCP and PAH contamination. Ferro said data from both phases indicate that a full-scale phytoremediation field study may be successful to remediate the contamination at the site.

Phytoremediation and Commercialization

Paul Thomas (Thomas Consultants) discussed phytoremediation as it pertains to commercialization. He explain ed that detailed information is needed to determine the kinds of soil that should be used for field- scale phytoremediation projects. Water movement, reductive oxygen concentrations, root growth, and root structures all affect future growth of plants and should be considered when implementing phytoremediation.

Thomas then noted that the success of phytoremediation by trees is often determined by root growth and that it is difficult to determine the direction roots will grow in the field. One way to do this, however, is to influence root growth patterns by digging a trench around the existing roots, using a pressure washer to uncover the roots, and covering them up again. Thomas then said that it is important to know the source of any contamination before deciding to use phytoremediation. He added that a full site characterization is needed if vadose zone soils are contaminated.

Thomas said that most owners of contaminated sites don't want to fund research on their sites, but seem to be willing to fund phytoremediation. In addition, there seems to be no incentive for researchers who implement phytoremediation projects to return to these sites to collect data to determine if the technology is working. Thomas said that all phytoremediation projects should include a "pre-plan" to ensure that data will be collected at sites in the future.

Thomas then showed slides of a LUST site where phytoremediation is being used to remediate petroleum contamination. Two rows of hybrid poplars were planted on the site in trenches and a monitoring well was built three feet down gradient from the trees. Next spring, researchers plan to use Hydropunch™ sampling to see if the technology is working.

THURSDAY, December 19, 1996

PANEL DISCUSSION ON REGULATORS'PERSPECTIVES ON PHYTOREMEDIATION

Jim Cummings, the Panel Moderator, led the Panel Discussion. He explained that this session was being held to address the relationship between regulation and remediation. The three most important programs that have a remediation component are CERCLA, RCRA, and TSCA, CERCLA via the National Contingency Plan has a remediation (versus regulatory) thrust. The statute itself provides relief from permit requirements (section 121(e)). RCRA and TSCA have regulatory requirements which impose duties and potential sanctions on researchers, technology developers and remediation practitioners, Familiarity with appropriate provisions of RCRA (for RCRA hazardous wastes) and TSCA (for PCB wastes) is recommended before commencing treatment activities

Cummings noted that to date there have been few, if any situations where potential application of RCRA requirements to a phytorernediation project has arisen. Most projects to date appear to involve voluntary cleanup programs not involving wastes subject to RCRA. There are some unresolved policy issues regarding the extent to which phytoremediation may be subject to RCRA. The Technology Innovation Office has initiated discussion with the Office of General Counsel and the Office of Solid Waste.

Cummings noted that discussions with federal and state regulators indicated a general receptivity to phytoremediation, *i.e.*, there did not appear to be any inherent bias against phytoremediation approaches.

Nevertheless, regulators tended to voice a recurring set of concerns. These concerns tended to be practical in nature (rather than narrow issues of regulatory requirements which regulators are sometimes accused of being hung up on), for example:

- At present, how does the science compare with the practice of this technology? Are the two in some appropriate balance?
- How can we evaluate potential efficacy? [clean-up timeframes and ability to reach desired cleanup levels]
- How long will the technology take before contaminant levels begin to decrease? Is the proponent simply "stalling" in proposing/applying this technology, since "time is money" and phytoremediation is so cheap?
- Is there potential for production of harmful daughter products and/or release of sequestered contaminants via transpiration?
- Overall, the regulators seemed to be looking for rules of thumb to be able to determine whether there is an appropriate match between the site and the proposed approach

Cummings then introduced the panelists for this session: Lisa Marie Price, U.S. EPA—Region 6; Richard Clarke, Texas Natural Resource Conservation Commission (TNRCC); Harry Compton, U.S. EPA—ERTC, Edison, NJ; and Thomas Wilson, U.S. EPA—Region 10 who provided some perspectives based on their site-specific experiences and their general experience as regulators.

U.S. EPA— Region 6 Phytoremediation Projects

Lisa Marie Price (U.S. EPA–Region 6) presented the group with her experience at three sites where phytoremediation either has been considered or implemented. The first site is an old munitions site where phytoremediation was considered to remove TNT product. Price noted that researchers continue to monitor the phytoremediation/natural degradation that appears to be occurring with the standing pines on the site.

The next site is an old pesticide plant in East Texas where portions of the site have been closed by a state order. Residual contamination has been found in the neighborhoods adjoining the site. Price explained that phytoremediation was considered as a remedy for the arsenic at the site, but EPA didn’t choose the technology because the site was being addressed as a time critical removal action in order to prevent recontamination of the neighborhood.

The third site, the Red River Army Depot, is a military vehicle refurbishing installation where phytoremediation is being considered as an option for treatment. Phytoremediation is being proposed by the Army to address chlorinated solvent contamination in ground water; however, because the installation is being realigned under the Base Realignment and Closure (BRAC program, creating clean-up time constraints, and because there is an inadequate understanding of the extent of the problem, EPA is hesitant to fully endorse phytoremediation as an integral part of the site’s remedy.

Phytoremediation and TNRCC

Richard Clarke (TNRCC) said that TNRCC has little experience with phytoremediation and is concerned about this technology’s application at sites where time constraints and risk reduction rules are an issue. He noted that phytoremediation may be a partial option for treatment, but under state rules, TNRCC has to approve all rules and is unsure how to permit phytoremediation projects.

Phytorernediation at Aberdeen Proving Ground

Harry Compton (U.S. EPA–ERTC, New Jersey) discussed a phytoremediation project being implemented on a historic bombing range at Aberdeen Proving Ground (APG) in Maryland. The site has old,toxic burning pits where munitions were burned, causing groundwater contamination with PCA, tetrachlorine, TCE, and chlorinated solvents eight feet under ground.

Compton noted that APG prefers the use of state policy to provide alternatives to cleanup and restore the aquifer. Compton added that researchers have considered a variety of technologies for cleanup, but most were ruled out because of the presence of UXO on the site. There are no clean-up time constraints for the site. Compton said the Army was willing to spend money to do phytoremediation, but wanted to refer to as a “revegetation study” until EPA and the Army can prove that the technology can work.

The site was planted with hybrid poplars and a trench was built to ensure that the trees would be taking up groundwater instead of rain water. Researchers were concerned about predator and frost problems, but the trees flourished and have already grown to 1-3 inches in diameter. Compton said that the Army has used three pairs of lysimeters, which were is nested at two different depths, to investigate vadose pore water and has monitored the leaves, stems, and roots of the plants on the site.

In addition, the Army and EPA plan to perform bag studies to measure VOCs in the air. Investigations show that PCA has been taken up by the plant roots but may not be translocated in the plant.

The Army is hopeful that the technology will work, but no direct evidence data currently has been collected from the site to determine if phytoremediation is being effective. According to Compton, there are plans to examine whether VOCs are present . in both woody and animal tissue. A short video has been developed for this project. For a copy, contact Compton at (908) 321-6751.

Phytoremediation and Regulation

Thomas Wilson (U.S. EPA-Region 10) explained that the regulatory community can make technology commercialization difficult. For example, while some regulators are willing to support field trials needed to advance a new technology, others prefer to wait until the technology is proven by someone else. And even after all studies are done, spreading the word among the many federal, state, and local regulators can present a daunting challenge.

Wilson then noted that some people may view phytoremediation as a ploy to give problem-site owners more time for cleaning their sites. Some (hopefully few) even argue that high cleanup costs are punishment for polluters, and that phytoremediation should thus not be used to lower those "punishment" costs.

Wilson then noted the absence of environmental groups at the meeting. He stressed their importance in achieving both public and regulatory acceptance of this new technology. Wilson then urged meeting attendees to actively seek opportunities to educate environmental and citizens' groups on phytoremediation.

OPEN DISCUSSION

Stuart Strand said regulators should be committed to ensuring that adequate data comes out of phytoremediation projects. John Fletcher noted that the only way to get phytoremediation commercialized is to obtain data from naturally occurring ecosystems where plants appear to have success in naturally remediating contamination that occurred in the past. He added that the success for phytoremediation is dependent on increased funding and that the government should be committed to providing funds to move the technology forward.

Steve McCutcheon noted that rigorous investigation is needed to determine the successful application of phytoremediation. He then expressed his concern that phytoremediation may end up being used at sites prematurely before scientists truly understand the state-of-the-science of this technology. Walt Kovalick said there should be a greater effort to gather data on phytoremediation, but didn't think this applied work would likely get done with research grants. Instead, it will probably need to be funded through partnerships and alliances.

Tom Wilson said EPA has not acknowledged phytoremediation as a technology that has applications beyond just cleanup. Terry McIntyre said considerations need to be made for source material and disposal of spent biomass when addressing phytoremediation.

Jerry Schnoor said regulators should be involved early in the technology selection process. He then noted that fate data should be collected for both laboratory and greenhouse studies. He added that geochronology of inffinsic bioremediation sites should be investigated.

Thomas Wilson said research in the area of phytoremediation is very fragmented and isolated data points won't give us the data we need to move forward. What we need are funding sources that can be accessed to integrate the data that has already been collected. John Fletcher said despite limited funding, available data from laboratory experiments can be used to determine what will happen in the field. He then noted that a holistic approach needs to be developed for risk analysis for toxics in ecosystems. Tom Wong agreed, but said that research should move forward at sites where phytoremediation makes sense.

Joseph Keflemarian (TNRCC) said that phytoremediation regulations, which include time constraints and require containment technology, should be in place before phytoremediation is used. This poses a dilemma, however, that would require support from the regulatory community and development of quick guidance on this issue by the states. Richard Clarke agreed, noting that once risk is contained, long-term solutions can be developed to determine if phytoremediation is working.

John Fletcher said enough is currently known to estimate evapotranspiration by plants and determine rainfall in certain areas. In addition, it is known that water run-off from sites needs to be collected for treatment by other methods. With this knowledge, there is no harm in initiating phytoremediation projects now. Stuart Strand responded that knowledge of seasonal variations and buffers for plume migration should be built into phytoremediation systems. He added that agronomic knowledge is very important to determine whether phytoremediation projects will be successful.

BREAKOUT GROUP REPORT-OUTS

After some discussion, the attendees decided to breakout into two groups: one to discuss chlorinated solvents and the other to discuss petroleum and pesticides. Each breakout group was charged to answer the following questions:

1) What are the important questions, which, if answered, will allow broad application of phytoremediation?

2) How shall these questions be addressed (*e.g.* laboratory, field, research and development, demonstrations)?

3) Who are the interested parties?

4) How shall we proceed (*e.g.*, meeting summary, teleconferences, electronic means, form a group like and RTDF)?

Petroleum/Pesticides Breakout Group

Phil Sayre, TIO, presented the attendees with his breakout group's findings. The following list includes the issues (noted by underlining) that the group identified to answer the first Question above: *What are the important questions, which. if answered, will allow broad application of phytoremediation*? Text under each of the underlined items addresses the second Question noted above: *How shall these questions be addressed (e.g. laboratory, field, research and development, demonstrations*?

1) Develop Fate and Transport Models for certain contaminants within plants.

The group acknowledged that existing ground water models can be used to a limited extent in phytoremediation applications, but that more integration of plant effects on groundwater need to be added to these models such as transpiration rates and their effects on groundwater. Also, models need to be developed that integrate plant effects on contaminants and water availability in the unsaturated zone. As part of this integration of plants into existing groundwater and vadose zone models, further work needs to be done to model the fate of contaminants within the plant tissues: distributions of metabolites in different plant tissues (stem, root, leaf) are difficult to predict, as well as transpiration rates for water and contaminants such as volatile organics.

2) Establish toxicity-driven regulatory endpoints that would apply to phytoremediation.

The group discussed ways for determining whether phytoremediation residuals are toxic. They agreed that phytoremediation tests should include toxicity assays for the end-products of phytoremediation including tissue metabolites and remaining chemicals present in soils/sediments following phytoremediation. The findings of the toxicity tests should be incorporated into the fate and models so that the total time for remediation of a site could be made based on toxicity of relevant compounds, fate and transport models could focus on those plant metabolites which pose the greatest risk, etc. Efforts should be made by those interested in pursuing toxicity testing, as it relates to phytoremediation, to become active in the Petroleum Environmental Research Foundation/Gas Research Institute (PERF/GRI) efforts in the area of toxicity testing. Members of the group also thought that since a significant portion of the PERF/GRI effort is focused on earthworm tests as an indicator of the toxicity of soils/sediments during the remediation process, fertilizer toxicity to earthworms should be examined.

3) Determine the bioavailability/mobility of phytoremediation residuals in soil

Linked with the issue of the toxicity of residual chemicals in soils following phytoremediation is the ability of these chemicals to become bioavailable to target organisms or move offsite. Some residuals, regardless of their toxicity, may be so tightly bound to soil that they cannot cause toxicity to organisms or move from the remediation site to other locations due to their inability to partition to the liquid phase. Further tests were recommended on remediation with grasses in which PAH and TPH concentrations are compared over time. After such long-term studies are done, is there binding of petroleum wastes to soils/sediments which decreases the mobility and/or toxicity of the wastes? Are there other plant species which should also be considered for such testing?

4) Identify federal funding vehicles for forensic studies of wastes.

The group discussed which agencies should be responsible for funding projects which would examine the decreased toxicity at sites which have become overgrown with plants as part of the natural ecological progression that occurs (so-called forensic studies of contaminated sites). As an example of such a site, see the presentation given by Mr. Tom Wong at this meeting. There is a need to identify which Federal Agency would fund such work and whether efforts should be focused on lab or field studies. The group agreed that data would need to be obtained from existing industrial sites and that regulators would need to ease restraints on site owners to gather more data. The group also discussed the extent to which small pipeline spills need to be cleaned up and which plant species occur at these sites which could be planted in similar locations.

5) Develop screening models that can identify whether phytoremediation will work at a site, and which

treatability tests need to be conducted.

Such a minimum data set would aid decisionmakers involved in assessing the utility of

phytoremediation at a site.

6) Determine the minimum data set that would be needed to show that phytoremediation has been efficacious at a site.

Such a minimum data set would also aid decisionmakers involved in assessing the utility of

phytoremediation at a site.

7) Development of a database that would indicate which plant species/cultivars are capable of assisting in the remediation of agricultural chemicals and petroleum hydrocarbons.

The group believed such a database could be begun by gathering existing data first from

the literature, and from some private companies which have begun this effort already.

Sayre next presented a list of the interested parties who should be involved in phytoremediation which was responsive to the third Question posed to the break out Group: *no are the interested parties?*

- Environmental Groups
- Landscape Architects and Process Developers
- Small and Medium Size Companies that Own Problem Sites
- Other Larger Companies

USDA

- Venture Capitalists
- Regulators (to provide a clarification of the regulations)
- Forestry Division (To provide information on large-scale monocultures)
- Soil Conservation Service
- Environmental Remediation Equipment Developers
- Plant Pathologists
- Department of Transportation (for advice on grass establishment)

NOAA

- Environmental Toxicologists
- Large Environmental Remediation Companies
- Local Agriculture Extension Services
- Ecologists

Finally, Sayre then described different avenues the group identified for continuing the discussion on phytoremediation, in response to the final Question posed: *How shall we proceed (e.g., meeting summary, teleconferences, electronic means, form a group like and RYDF?*

1) An electronic meeting place (*i.e.*, WWW site or electronic bulletin board system) should be developed for at least two purposes: to provide a database of the results of phytoremediation tests which have been conducted, and to serve as a question-and-answer forum.

2) There should be a participant follow-up conversation on partnering in three-months.

3) The list of interested parties noted above should be prioritized in order to focus in on

those most likely to be of assistance.

4) A second meeting should be held to further discuss phytoremediation. This meeting could be held in conjunction with Batelle's "Fourth International Symposium on *In Situ* and On-Site Bioremediation," which is being held in April in New Orleans and will likely attract the most participants from the Ft. Worth meeting. Alternatively, a meeting could be arranged in conjunction with the IBC Phytorermediation Meeting, which is being held in Seattle this June.

5) A minimum data set should be developed by Industry and the U.S. and Canadian Federal Governments that would be provided by those who clean up a waste site that would provide convincing evidence that the site has been remediated.

6) The issues of phytoremediation should be tied into an existing RTDF since funding is already available for such an effort. (Wait Kovalick noted that an RTDF can be developed without funding commitments. He added that the initial success of an RTDF is not so much determined by funding as it is by the travel and time commitments each member is able to give.)

Chlorinated Solvents Breakout Group

Steve McCutcheon presented the Chlorinated Solvents Breakout Group's findings. The following list includes the issues the group identified to answer *What are the important questions, which, if answered, will allow broad application of phyforemediation?*

- Plant mass balance, uptake, breakdown, transport, and transpiration
- Dose response and pharmacokinetics models for plants
- Fate and transport models
- Field sampling protocols, demonstration end points, key questions, important risks, risk assessments
- Guidelines on phytoremediation for regulators and decision makers

McCutcheon then noted that the group agreed that a solid research and development strategy is needed. This strategy could include the following:

- One or more field demonstrations.
- Directed lab research to support field demonstrations.
- Intrinsic Remediation and Phytoremediation Protocol (Design Guidance).
- Paleoecology and forensic toxicology data on sites which have been revegetated.
- Technical Evaluation Panel for vendors (such a group would be critical for ensuring that vendors are qualified in remediation; not just planting grass.)

McCutcheon then presented some consensus points developed by the group:

- An RTDF Action Team is needed for general networking and communication, which could include teleconferences and e-mails.
- The Interested Parties who need to be included at the table are:

- Air Force, Army, Navy, and other components in the Department of Defense

- Department of Energy
- Chemical Manufacturers' Association, Gas Research Institute, and Electric Power Research Institute
- Insurance Companies
- DuPont, Union Carbide, Ciba-Geigy, Monsanto, Dow Chemical, and Occidental Chemical
- Other groups that support RTDF groups.

Funding could be provided by:

- Department of Defense
- Department of Energy

- EPA

- National Science Foundation
- Industry
- Private Foundations
- Venture Capitalists
- Technology Developers

Technology developers who should be involved include:

- U.S. Department of Agriculture
- Agronomists
- Botanists
- Ecologists
- Biotechnology Firms

- ASTM

Other groups who should be involved in the phytoremediation discussion include:

- Regulators; the Interstate Technology and Regulatory Cooperation Workgroup (ITRC)

- Environmental Groups
- Citizens' Groups

McCutcheon then noted that the group agreed that chlorinated solvents behave differently than petroleum hydrocarbons and should be covered by a separate partnering group. John Fletcher said he couldn't agree more, noting that a distinction between soluble versus insoluble compounds should be made when discussing implementation of phytoremediation because insoluble compounds involve different processes, including bacterial degradation.

CLOSING REMARKS

Walt Kovalick informed everyone that EPA will e-mail out the attendees list to all attendees early next week. He added that EPA will explore the idea of establishing a web site for phytoremediation that could include a "chat room" for sharing ideas on phytoremediation. EPA also will explore the idea of establishing an RTDF for phytoremediation. He then noted that TIO is willing to act as a clearinghouse of information on phytoremediation.

Kovalick said that EPA will consider planning a meeting on Phytoremediation, possibly in conjunction with the New Orleans or Seattle Phytoremediation meetings, Tom Wong noted that TNRCC plans to hold its large conference at the same time of the New Orleans meeting, which would exclude participation by any TNRCC employees if New Orleans was chosen as the meeting place. Kovalick then said that EPA would be willing to set up a series of teleconferences to discuss phytoremediation until a decision is made when to hold the meeting.

The meeting adjourned.

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http://www.epa.gov/swertiol/download/minutes/phytomin.htm
Page last modified: August 14, 1997

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June 25, 1999

BY HAND

Mr. Richard Puvogel
Project Manager
U.S. Environmental Protection Agency
19th Floor
290 Broadway
New York, New York 10007-1866

Re: **Federal Creosote Site, Manville, N.J.**

Dear Mr. Puvogel:

We are submitting herewith, in accordance with the extension of the public comment period, our client's supplemental comments on the EPA Proposed Plan for the Federal Creosote Site. These comments augment the comments submitted to you on June 1, 1999. They are the result of a review of the three boxes of raw data and the administrative record file that you made available last week in the EPA Region II office.

The May 3, 1999, comments by the National Remedy Review Board (NRRB) raise many of the concerns discussed in our initial comments.[1] The enclosed supplemental comments further emphasize the serious flaws in the EPA Proposed Plan.

C The NRRB comments urge EPA to complete the ongoing site-wide RI/FS and develop a cleanup strategy for the entire development before actual removal of any source material. For example, should additional homes be bought out, on site treatment options may become more practicable.

C The EPA Proposed Plan is also premature in that it relies on only a limtted set of data to identify the alternative. EPA should await the compilation and evaluation of the larger body of data currently being

[1] The NRRB comments were not in the Manville public record that we reviewed and copied, and thus we could not discuss the NRRB comments in our June 1 submission.

generated as part of a site-wide RI/FS. There is no public health justification for a piecemeal approach to the site, based on the findings of ATSDR.

C The NRRB comments state that EPA should have developed, considered and documented alternatives that reflect the scope and complexity of site problems being addressed. EPA's rationale for proposing only one alternative and excluding other alternatives from consideration, such as thermal desorption, is unsupported.

EPA should have expected to receive comments from NRRB based on EPA's meeting with NRRB, which is referenced in the May 3 NRRB letter. However, the Proposed Plan was issued by EPA without awaiting receipt of the NRRB comments. This is an important deviation in procedure warranting reconsideration of the Proposed Plan by EPA.

Please contact me if you have any questions concerning the enclosed comments.

Sincerely yours,

Theodore L. Garrett

Enclosure

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ATTACHMENT 1

ATTACHMENT 2

SUPPLEMENTAL COMMENTS
ON THE
SUPERFUND PROPOSED PLAN
FEDERAL CREOSOTE SITE
MANVILLE, NEW JERSEY

This document presents supplemental comments on the EPA Proposed Plan for the Federal Creosote Site (the "Site") in Manville, New Jersey. Our June 1, 1999, comments expressed concerns that EPA's process of selecting a preferred alternative was biased and overlooked other remedial alternatives that could remedy the Site at significantly lower cost. Since those comments were submitted, we reviewed comments by the National Remedy Review Board (NRRB) and three boxes of data not previously made available in the public record. This new information underscores our prior concerns and raises several new issues:

- C The NRRB comments highlight EPA's need to complete the ongoing Site-wide RI/FS and develop a cleanup strategy for the entire development before actual removal of any source material. They also demonstrate why the EPA Proposed Plan is premature in that it relies on only a limited set of data to identify the alternative. EPA should have developed, considered and documented alternatives that reflect the scope and complexity of Site problems being addressed.

- C The additional technical data made available show that the analytical data relied on by EPA are suspect. In addition, the reliance on visual contamination in developing and implementing EPA's Proposed Plan is inappropriate due to the presence of diesel fuel in the samples. Finally, there are insufficient data to support the conclusion that the lagoons and canals are continuing sources of contamination.

These concerns are discussed in more detail below.

1. The EPA Proposed Plan is premature in the absence of a completed Site-wide, Remedial Investigation and Feasibility Study (WS).

The EPA Proposed Plan is premature, particularly in light of the fact that environmental data are still being developed as part of an ongoing RI/FS. Hence, it is inappropriate to move forward with the preferred alternative in the EPA

Proposed Plan until a full comparative analysis of remedial alternatives, as contemplated in the National Contingency Plan (NCP), is completed.[1]

Our contention is supported by the NRRB as stated in the memorandum found in the administrative record in EPA's Region 2 office.[2] The NRRB states that the EPA Proposed Plan considered only a single cleanup alternative; it emphasizes the need to complete a Site-wide RI/FS; and recommends that on-site treatment alternatives be considered as part of a Site-wide RI/FS.

2. There is uncertainty about Site conditions that could impact waste treatment and/or disposal options.

The Agency for Toxic Substances and Disease Registry (ATSDR) has determined there is neither an immediate nor short-term health threat under existing conditions. Therefore, the more prudent course of action is to await completion of the ongoing sampling and RI/FS as referenced in the EPA Proposed Plan. Then, a baseline risk assessment can be completed to develop Site-specific soil cleanup objectives so appropriate response actions can be considered.

The NRRB memorandum states that the EPA selected its preferred alternative without the benefit of fully understanding Site conditions. As a result, the EPA Proposed Plan did not consider an appropriate range of remedial alternatives that adequately took into account these considerations. The NRRB memorandum points out that the appropriate handling of any excavated material or decision on land-use options should be based on a more thorough cleanup strategy.

A more thorough cleanup strategy should focus on-site, ex situ and in situ remedial alternatives, as well as off-site ex situ treatment/ disposal options other than incineration. As stated in our prior comments, there are on-site, in situ and ex-situ, treatment options that are equally protective and more cost effective than the preferred alternative in the EPA Proposed Plan. They should have been part of the range of alternatives considered in developing the EPA Proposed Plan. Additionally, as we previously commented, off-site facilities exist that can accept the material for thermal treatment (New Jersey), recycling or land disposal (Canada). As noted by the NRRB, on-site treatment options may become more practicable following completion of a Site-wide RI/FS. The range of in situ and ex situ remedial alternatives that we identified in our prior comments have been

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[1] National Oil and Hazardous Substance Pollution Continency Plan, 40 CFR Part 300, section 300-430 (e) (2) (iii), (ii), (9), (ii) March 8,1990 (revised September 14,1994).
[2] National Remedy Review Board Recommendations for the Federal Creosote Site, Bruce K. Means, Chair, National Remedy Review Board, to Richard L. Caspe, Director, Emergency and Remedial Response Division, EPA Region 2, (Noted as signed by BK Means on May 3,1999)

employed at other similar CERCLA sites and are far more cost-effective than the preferred alternative in the EPA Proposed Plan.

3. EPA failed to develop and consider a full range of remedial alternatives.

The EPA Proposed Plan considered only a single alternative. To ensure consistency with the NCP, a more comprehensive evaluation of alternatives needs to be documented before acceptance of the EPA Proposed Plan and issuance of a ROD. This evaluation is properly done at the conclusion of the ongoing RI/FS. The considered alternatives should include biological and thermal treatment options as outlined in our prior comments. Only then will EPA be able to demonstrate they are controlling response costs while promoting a consistent and cost-effective decision.

Because EPA considered only a single alternative, the NRRB was unable to achieve one of its key objectives; investigating whether other approaches to achieve cleanup had been evaluated. This is one of the subjects that the NRRB is tasked to complete when it reviews a cleanup strategy for consistency with the NCP.[3]

4. The failure to use cleanup techniques setforth in SW-846 adversely affected the accuracy of reported concentrations and elevated the sample detection limits.

EPA made available the raw data from approximately 300 samples that were collected as part of the lagoon and canal delineation for review during this extended comment period. The data are predominately from soil samples that were analyzed for polynuclear aromatic hydrocarbons (PAHs). The quality assurance information from selected random samples identified problems associated with surrogate recoveries, and matrix and matrix spike duplicate (MS/MSD) analyses. These problems were identified and addressed by the EPA contractor's validators.

Detection limits were elevated in many of the samples reviewed, primarily due to high concentrations of both target PAHs and non-target heterocyclic PAHs, as indicated in the tentatively identified compound (TIC) data included in the validation reports. Neither of the two laboratories that analyzed the samples used any of the clean-up techniques presented in SW-846 to improve detection limits or bring MS/MSD analyses into control by removing the heterocyclic PAHs.

[3] The National Remedy Review Board Progress Report: Fiscal Year 1996, *What Does the Board Look At When It Reviews A Decision?*

In not following the prescribed procedures set forth in SW-846, much of the reported concentrations relied upon to develop EPA's Proposed Plan were biased high. Consequently, any calculated exposure point concentrations, like benzo(a)pyrene (BaP) equivalents, are overstated. An inaccurate assessment and communication of potential risks will result if biased high data is relied upon to characterize risks.

5. ***The reliance on visual contamination in developing and implementing EPA's preferred alternative is inappropriate due to the presence of diesel fuel in the samples.***

The EPA Proposed Plan states that a subjective criterion, visible contamination, was used for the cleanup criterion and resultant cost and volume estimates. If relied upon during implementation of the remedy, the presence of diesel fuel will distort the scope of the excavation and likely result in unnecessary removal and treatment of soil.

The diesel fuel was identified in the PAH gas chromatographs (GC) as a series of symmetric peaks at a retention times of approximately 18 to 22 minutes. The corresponding mass spectra from late eluting PAHs, such as benzo(g,h,i)perylene, show alkyl fragmentation patterns not characteristic of the parent PAH, confirming the presence of the diesel fuel.

6. ***There are insufficient data to support the conclusion that the lagoons and canals are active sources of contamination.***

As a result of reviewing the additional documents provided by EPA during the extended comment period, we have concluded there are insufficient data to show that the lagoon and canal areas are active source areas. Hence, the EPA should await completion of the Site-wide RI/FS so that a comprehensive remedial strategy can be developed that addresses all contamination in a cost-effective and protective manner.

The groundwater data and physical conditions encountered beneath Lagoon A suggest the PAHs are not migrating. Specifically, the Technical Memorandum prepared in November 1998 indicates that there is a dense silt layer, which could not be penetrated beneath Lagoon A. If continuous, this layer would serve to inhibit downward migration from the lagoon. With the exception of one geoprobe sample believed to be water from within Lagoon B, groundwater sampling, conducted at various locations around the development, did not detect any constituents above MCLs. Additionally, many of the soil samples collected from the lagoons had percent solids concentrations of greater than 90 percent, suggesting the material has a consistency similar to asphalt. As the PAHs also have extremely low aqueous solubilities, there is no basis for EPA's rationale for characterizing these as major sources of soil and ground water contamination.

Attachment 1

<u>National Remedy Review Board Recommendations for the Federal Creosote Site</u>, Bruce K. Means, Chair, National Remedy Review Board, to Richard L. Caspe, Director, Emergency and Remedial Response Division, EPA Region 2, (Noted as signed by BK Means on May 3, 1999)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

Signed by BK Means on 5/3/99
Original with Region

OFFICE OF
SOLID WASTE AND
EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: National Remedy Review Board Recommendations for the Federal Creosote Superfund Site

FROM: Bruce K. Means, Chair
National Remedy Review Board

TO: Richard L. Caspe, Director
Emergency and Remedial Response Division
EPA Region 2

Purpose

The National Remedy Review Board (NRRB) has completed its review of the proposed remedial action for the Federal Creosote Superfund Site in Manville, Now Jersey. This memorandum documents the NRRB's advisory recommendations.

Context for NRRB Review

As you recall, the Administrator announced the NRRB as one of the October 1995 Superfund Administrative Reforms to help control response costs and promote consistent and cost-effective decisions. The NRRB furthers these goals by providing a cross-regional, management-level, "real time" review of high cost proposed response actions. The board reviews all proposed cleanup actions that exceed its established cost-based review criteria.

The NRRB re view evaluates the proposed actions for consistency with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and relevant Superfund policy and guidance. It focuses on the nature and complexity of the site; health and environmental risks; the range of alternatives that address site risks; the quality and reasonableness of the cost estimates for alternatives; regional, state/tribal, and other stakeholder opinions on the proposed actions, and any other relevant factors.

Generally, the NRRB makes "advisory recommendations" to the appropriate regional decision maker before the region issues the proposed response action for public comment. The region will then include these recommendations in the Administrative Record for the site. While the region is expected to give the board's recommendations substantial weight, other important factors, such as subsequent public comment or technical analyses of response options, may influence the final regional decision. It is important to remember that the NRRB does not change the Agency's current delegations or alter in any way the public's role in site decisions.

NRRB Advisory Recommendations

The NRRB reviewed the informational package for the proposed remedial action at the Federal Creosote Site and discussed related issues with EPA project manager Rich Puvogel on March 10, 1999. Based on this review and discussion, the NRRB offers the following comments.

- The regional proposal considered only a single cleanup alternative that would buy and demolish homes above subsurface contaminant source materials. These source materials would then be excavated and incinerated off site. The board supports the need for action at this site, as well as the region's plan to buy and demolish about a dozen homes. Such work will be necessary to address the high contaminated source material under any circumstance. However, prior to the actual-removal of any source material, the board believes that the Region should complete the ongoing site-wide RI/FS and develop a cleanup strategy for the entire housing development. This strategy should identify the full extent and magnitude of soil contamination in the area, appropriate response actions to address this contamination, site-specific soil cleanup objectives, appropriate disposition of any excavated material, and resulting land use options.

- The region should work closely with the community to determine how best to preserve the integrity of the existing residential community given the apparent need to demolish the homes. However, given the stated uncertainty about the potential contamination not addressed by this proposed action, the site-wide cleanup strategy mentioned above should also describe the criteria or circumstances that would lead to the buy out of additional homes, or the entire development, and, in addition, the effect such decisions would have on waste treatment and/or disposal options. That is, should a more extensive buy out be required, on-site treatment options may become more practicable. Thus, the board recommends that the region include an assessment of omsite treatment alternatives (e.g., soil washing, in situ chemical oxidation (ISCO)) as part of the site-wide RI/FS.

- The site package provided little discussion of the range of alternatives considered against the NCP's nine criteria In addressing the subsurface contamination problems.

However, the presentation to the board made it clear that additional alternatives were evaluated. The NCP (FR Vol. 55, No. 46, March 8,1990, p.8704) encourages early actions "prior to or concurrent with conduct of an RI/FS as information sufficient to support remedy selection" is developed, but also indicates that the alternatives evaluation and documentation "reflect the scope and complexity of the site problems being addressed." Accordingly, since the proposed early action involves relatively complex remedy selection issues (e.g., permanent/temporary relocation, costly off-site treatment, phasing of site study and actions), the board recommends that an appropriate supporting analysis addressing these issues, and the other waste management options considered, be included in both the proposed plan and ROD.

- The region plans to use sheet piling as soil retaining walls during excavation. Given the limited excavation depths expected in some areas, the board believes the region can save money by using less expensive engineering methods (e.g., simple graded slope) in lieu of sheet piling where feasible.

The NRRB appreciates the region's efforts to work closely with the state and community groups at this site. The board members also express their appreciation to the region for its participation in the review process. We encourage Region 2 management and staff to work with their regional NRRB representative and the Region 2/6 Accelerated Response Center in the Office of Emergency and Remedial Response to discuss any appropriate follow-up actions.

Please do not hesitate to give me a call if you have any questions at 703-603-8815.

cc: S. Luftig
T. Fields
B. Breen
J. Woolford
C. Hooks
R. Hall
OERR Center Directors

Attachment 2

The National Remedy Review Board Progress Report: Fiscal Year 1996, What Does the Board Look At When It Reviews A Decision? USEPA Memorandum December 18,1997. Review of Non-Time Critical Removal Actions by the National Remedy Review Board

EPA United States Environmental Protection Agency Superfund

The National Remedy Review Board Progress Report: Fiscal Year 1996

Introduction

EPA created the National Remedy Review Board (the Board) in January 1996 as part of a comprehensive package of reforms designed to make the Superfund program faster, fairer, and more efficient. This report highlights the Board's significant accomplishments in its first year of operation, It also presents information intended to help those interested in the Board's work learn more about the review process, its contribution to the Superfund program, and how interested parties can contribute to review efforts.

In the next section we describe the Superfund reform initiative and explain how the Board contributes to its goals. The following sections present information on the Board's first year of operation, its effect on Superfund cleanups, and resource issues. Included as attachments to this report are several EPA documents and memoranda that provide detailed information about Board operating procedures, cleanup decision reviews, and other issues.

EPA's Superfund Reforms

The Superfund program is one of our country's most ambitious and complex environmental programs. It arose out of the need to protect citizens from the dangers posed by abandoned or uncontrolled hazardous waste sites. When CERCLA[1] (the Superfund law) was enacted, the challenge of cleaning up what was assumed to be a few hundred discrete, land-based cleanups appeared relatively straightforward. However, the problem of neglected hazardous waste sites has revealed itself to be far more complicated and widespread than anyone at first realized.

We now recognize that the number and complexity of hazardous waste sites across the nation dwarf original estimates. To date, EPA has identified more than 41,000 sites and assessed more than 39,000 of them, Almost 1,400 of these sites have been considered a serious enough threat to be designated a Federal priority for cleanup on the National Priorities List (NPL). EPA has completed construction of all cleanup activity at about thirty percent (410) of these. The vast majority of the remaining NPL sites are either under study or being cleaned up.

In addition, Superfund has conducted emergency responses and prompt removal actions to attack the most immediate threats of toxic exposure at more than 3,000 sites in communities across the country. Through these "emergency response" actions, EPA continues to protect public health and the environment from immediate risks.

As a logical outgrowth of EPA's experience in managing the Superfund program, EPA has put in place a series of Superfund reforms. These reforms substantively change the way the Superfund program handles its cleanup responsibilities within existing laws. They are aimed at accelerating the pace and reducing the cost of cleanups, streamlining remedy selection, increasing fairness, promoting economic redevelopment, and better integrating Federal and State cleanup programs. Within these changes, however, remedies are preferred that incorporate treatment technologies and provide long-term reliability for site cleanup. The Agency believes these reforms will save cleanup dollars without sacrificing public health or environmental protection. In October 1995, EPA announced its final round of reforms. One of the principal reforms in this final round is the National Remedy Review Board.

[1] *Superfund is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended 42 US.C. §9601 et. seq. The program's principal implementing regulation is the National Oil and Hazardous Substances Pollution Contingency Plan, also known as the NCP, 40 CTR Part 300.*

The National Remedy Review Board

Assistant Administrator Elliott Laws announced the Board's formation in a November 28, 1995, memorandum to Regional Waste Management Division Directors (attachment 1). As stated in the memorandum, the Board's goals are to promote cost-effectiveness and national consistency in remedy selection at Superfund sites. To accomplish this, EPA staffed the Board with technical experts and senior managers from each EPA Region and several EPA Headquarters offices. This group of experienced personnel provides a unique and impartial audience with which to discuss cleanup strategies, issues of national consistency, and the cost-effectiveness of cleanup actions. The Board analyzes proposed site-specific cleanup strategies in "real time" to ensure that they are consistent with the Superfund law, regulations, and relevant agency guidance. Attachment 2 presents a list of Board members.

The Board reviews all proposed cleanup decisions where (1) the proposed action costs more than $30 million; or (2) the proposed action costs more than

$10 million and this cost is 50% greater than that of the least-costly, protective cleanup alternative that also complies with other laws or regulations that are “applicable” or “relevant and appropriate” to a site decision or action.

The Board plans to review sites early in the remedy selection process, before the Region releases the proposed plan for public comment. Occasionally, however, a post-proposed plan site may benefit from Board review. For example, remedy changes in response to public comment may increase the total remedy costs. Where these additional cleanup costs exceed 20 percent of the original cost estimate and trigger normal Board review criteria, the Board may review the draft remedy. Please see attachment 3 for a depiction of the various steps in the Superfund remedial process and where Board review occurs. After its review, the Board issues advisory recommendations as to how or whether a potential Superfund site remedy decision can be improved. The recommendations are not binding, but EPA Regional decision makers give them substantial consideration. Although this effort is a valuable enhancement to the current decision making process, it is important to remember that this reform does not change current delegation of authorities or diminish in any way the public's current role in site cleanup decisions. Please refer to attachment 4 of this document for a more detailed explanation of the role of interested parties in the review process.

The National Remedy Review Board Process

- The EPA remedial project manager (RPM) in charge of the site develops an informational site package that forms the basis of Board review. The package presents basic site information as well as technical information on exposure and risk assessment scenarios, cleanup goals, and cost estimates for various cleanup alternatives.

- The Region consults with key State/Tribe decision makers to guarantee State/Tribe concerns are conveyed accurately and completely in the package.

- The RPM also solicits information from PRPs who conduct remedial investigation/feasibility studies (RIFS) and community representatives. Their submissions are included as attachments to the informational site package.

- Each site decision discussion is divided into two phases: an **information sharing** phase, to which State/Tribe representatives are routinely invited, and a **deliberative** phase. The Board will invite the State/Tribe to participate in the deliberative discussion for State/Tribe-lead Fund-financed decisions, and for State/Tribe enforcement-lead decisions where the State/Trive seeks EPA concurrence. Otherwise, the Board limits its deliberative discussions to EPA personnel.

- Shortly after each review, the Board sends any advisory recommendations to the appropriate Regional Division Director in a brief memorandum.

Summary of Fiscal Year 1996 Accomplishments

Fiscal year 1996 has been a challenging but very productive year. Below are some of the Board's significant accomplishments in its initial year of operation.

- Developed the Board's mission, identified key technical experts and managers, and began deliberative operations within eight weeks of the formal announcement from Assistant Administrator Elliott Laws.
- Held deliberative meetings in January, March, May, June, and August.
- Reviewed each of 12 proposed Regional Superfund decisions that triggered Board review criteria.
- Issued substantive or technical recommendations for nine of the 12 decisions reviewed. These recommendations are expected to increase the cost effectiveness of the decision by strengthening overall cleanup strategies. The Board supported without substantive comment three of the proposed actions.
- Contributed to improved national consistency in Superfund remedy selection.
- Recommended analyses that may ultimately reduce total cleanup costs for all sites reviewed in fiscal year 1996 by as much as $15 million to $30 million (please see next page for further explanation).
- Contributed to an enhanced role in Superfund remedy selection for States/Tribes, private parties, and communities at high stakes sites.
- Confirmed that, overall, the Superfund program is making sound, cost effective, remedy decisions that are consistent with the Superfund law, its regulations, and guidance.

Board Reviews

Of the 12 proposed cleanup decisions submitted by EPA Regional offices for review, the Board finally supported three decisions with only minor recommendations. Of the remaining nine, the Board generally supported, with technical recommendations, another three decisions. For six decisions, the Board offered more substantive recommendations. In all cases, the Regions will conduct analyses to decide whether and to what extent the reviews may ultimately affect their cleanup approaches. For a summary of characteristics for all decisions reviewed in 1996 see Table 1.

Although several Regions are still considering Board comments on proposed decisions, already the Agency is encouraged by the range of benefits observed from the review process, including improved national consistency, clarity of decisions, and cross-Regional communication on key remedy selection issues. In some cases review recommendations have contributed to much lower site cleanup costs. For example, in Region 8, Board advisory recommendations regarding management of low-level threats at the Petrochem/Ecotek site contributed to an estimated reduction in total cleanup costs of approximately $8 million.

At the Jack's Creek site in Region 3, Board discussion of principal threats may ultimately reduce soil cleanup costs at the site by as much as $10 million to $15 million. EPA expects additional cost reductions in the future from other fiscal year 1996 reviews. Overall, the Board members indicate potential cost reductions in the range of $15 million to $30 million in total site cleanup costs from reviews conducted this fiscal year.

Of course, cost reductions are only part of the story. By targeting sites for review early in the Superfund process -- in most cases before proposed plan issuance -- important sites benefit from the Board's expertise and discussion before EPA site managers make key decisions in the final remedy, reducing the potential for revising the cleanup strategies later in the process. Moreover, cost reductions do not reflect the value of benefits that come from a general increase in scrutiny of cleanup costs, increased national consistency in remedy selection, improved technical analysis of promising cleanup strategies, better-articulated decision rationale at high stakes sites, and increased confidence of Agency staff and stakeholders in the final remedy.

In addition, the review process has stimulated cross-Regional dialogue on a broad range of issues that affect sites other than the high-cost sites. For example, the Jack's Creek review exposed the fact that although most EPA Regions used a particular model to assist in calculating adult lead exposure, several did not. Because the Board members communicate the lessons learned from their reviews within and across the Regions, project managers at a site in Dallas, Texas, realized that they might also use the model. As a result, they were able to adjust lead cleanup goals and potentially save a significant amount of money while improving overall program consistency.

Attachment 5 provides the full text of publicly available Board recommendations as of November 1, 1996.

What Does the Board Look At When It Reviews a Site Decision?

The Board analyzes the cleanup strategy to ensure that it is consistent with the Superfund law and the National Oil and Hazardous Substances Pollution Contingency Plan (or NCP). The NCP is the Federal regulation that details procedures for responding to oil or hazardous substances releases. The Board also considers relevant EPA cleanup guidance.

When they review a site, the Board members ask many questions about the proposed cleanup strategy. Site-specific circumstances nearly always influence the nature of the discussion. Among others, Board members investigate subjects like these below:

- What are the site characteristics that present a threat to human health and the environment?
- What is the rationale behind exposure scenarios and risk assumptions?
- What are the details of the Regional proposal for site cleanup?
- Are the cleanup goals appropriate and attainable?
- Have other approaches to achieve the cleanup goals been evaluated?
- Are the cost estimates reasonable?
- What are the concerns of the States/Tribes, PRPs, and communities?
- Is the strategy consistent with other Agency decisions?

Year-End Assessment

To assess its overall performance in fiscal year 1996, the Board conducted an in-depth analysis of its effect on individual site decisions. In interviews with Regional staff who participated in the reviews, Board members addressed subjects such as the effects of the reviews on site cleanups; how the reviews affected management involvement in site decisions; and whether the reviews improved remedy consistency, remedy protectiveness, or cost effectiveness. They also discussed ways to improve the review process.

Overall, participants found the experience a positive and worthwhile contribution to the remedy selection process for their respective sites. Generally, these Regional staff believe the process improves national consistency on important issues, adds credibility to Regional decisions, and can identify money-saving alternatives the initial Regional analyses did not consider. On the other hand, Regional staff expressed some frustration with the workload the review process places on them. They also raised concerns about the potential for delays in cases where reviews raise fundamental questions. Summarized below are responses from the Regional review participants to general questions about the Board's effect on the cleanup decisions.

- The reviews did not affect the cleanup schedules for most of the proposed decisions.

- Overall, the prospect of Board review increased Regional management involvement in the proposed decisions. It also resulted, in some cases, in management interest at an earlier point in the decision making process than would have occurred otherwise,

- Some participants see a benefit for the Regions in that Board reviews and subsequent advisory recommendations add credibility to final Regional decisions since these decisions will have had the added benefit of additional independent technical review.

Operating Improvements

EPA recognizes that the Board's operating protocol need to reflect a meaningful role for parties with a stake in the review process. With this in mind the Board made a substantial investment early on to work with interested parties and understand their concerns. For example, States/Tribes felt strongly that since they work closely with EPA in developing proposed cleanup strategies the Board discussions would benefit from the State perspective. The Board agreed, and has adopted procedures to ensure significant State/Tribe involvement in the review process. In addition, PRPs and community advocates sought to guarantee that their interests would be accurately and completely conveyed in materials reviewed by the Board. In response to this concern the Board decided to solicit written technical comments from key PRPs and community groups, Attachment 4 describes in greater detail the role of interested parties in the review process.

As a result of the Board's dialogue with interested parties EPA issued a September 26, 1996, memorandum titled "National Superfund Remedy Review Board" that formalizes refinements in the Board's operating protocol (see Attachment 6). These refinements reflect the concerns of interested parties as well as EPA Regional project managers. Among other things, they will ensure: 1) timely review of proposed site decisions prior to the issuance of the proposed plans; 2) prompt notification of key private sector stakeholders, States/Tribes, recognized community groups and technical assistance grantees, and other Federal agencies; 3) thorough consideration of stakeholder concerns in the review discussions; and 4) a continuing dialogue with interested parties to assure that the Board process is agreeable and fair to all involved.

FY96 Operating Costs and FY97 Cost Projections

EPA estimates that fiscal year 1996 Board activities cost approximately $523,250. These estimates include salary and expense monies for Board members, Board support staff, and Regional management/RPMs; travel to and from the Board meetings; and incidental costs (e.g., fees for meeting rooms). These costs average out to approximately $43,600 per decision reviewed by the Board.

In fiscal year 1997 the Board will likely review between 10 and 20 sites. Based on the 1996 average of approximately $43,600 per decision and a five percent inflation rate, the Board will require between $450,000 to $900,000 for salaries, expenses, and travel.

Conclusion

This past fiscal year was a challenging one for the entire Agency. Government shutdowns and funding uncertainty disrupted site cleanups and increased the workload on both Headquarters and Regional EPA staff. Even so, the National Remedy Review Board accomplished a great deal, The hard work of the Board members and strong support of Regional management and staff has paid off in significant cost savings, improved national consistency, more robust decision analysis, and an enhanced role in the remedy selection process for State/Tribes, private parties, and communities at high stakes sites.

Overall, the Board believes its reviews confirm that the Superfund program is making sound, cost effective, remedy decisions that are protecting public health and the environment consistent with CERCLA, its regulations, and guidance. At the same time, the experience of the past year has shown that there are instances in which the management level, cross-Regional Board discussions can save money and add value both to proposed cleanup strategies and to program decision making as a whole. As the Superfund program continues its work in the coming years, it remains important for EPA to provide both the public and Congress the assurance that Superfund remedies are both cost effective and protective of public health and the environment. The Board believes it has made important contributions to these goals in fiscal year 1996 and looks forward to similar success in the coming year.

Attachments:

1. 11/28/95 EPA Memorandum: "Formation of the National Superfund Remedy Review Board"
2. National Remedy Review Board Members
3. Chart Depicting Board Review Timing for High Cog Cleanups in the Superfund Site Remediation Process

4. Role of Interested Parties in the Review Process
5. Full Text of Publicly Available National Remedy Review Board Advisory Recommendations
6. 9/26/96 EPA Memorandum: "National Superfund Remedy Review Board"

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URL: http://www.epa.gov/superfund/programs/nrrb/rem_rev/intro.htm
This page last updated on October 6, 1998
Web Page maintained by Office of Emergency and Remedial Response
Comments: *superfund.info@epa.gov*

EPA United States Environmental Protection Agency Superfund

ATTACHMENT 1

Formation of the National Superfund Remedy Review Board

MEMORANDUM

SUBJECT:

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Formation of National Superfund Remedy Review Board
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FROM:

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Elliott P. Laws
Assistant Administrator
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TO:

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Director, Office of Site Remediation and Restoration - Region I
Director, Emergency and Remedial Response Division - Region II
Director, Hazardous Waste Management Division - Regions III, TX
Director, Waste Management Division - Region IV
Director, Superfund Division - Regions V, VI, VII
Assistant Regional Administrator, office of Ecosystems Protection
   and Remediation - Region VIII
Director, Environmental Cleanup Office - Region X
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DATE STAMPED:

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NOV 28 1995
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PURPOSE

This memorandum requests your assistance in establishing the National Superfund Remedy Review board recently announced by the Administrator as one of the key

Superfund Administrative Reforms. This Review Board is intended to help control remedy costs and to promote both consistent and cost-effective decisions at Superfund sites, including federal facilities.

BACKGROUND

As you all know, cost plays an important role in Superfund response decisions. The statute, in fact, mandates that, in addition to being protective, all remedies must be cost-effective. This mandate is built into the remedy selection process established under the National Contingency Plan (NCP), and expanded upon in a number of related program guidances. In this year of greatly reduced budgets, it is even more important for us to focus on this criterion in our decision making. On October 2, 1995, EPA Administrator Carol Browner announced a collection of Administrative Reforms intended to help our program achieve significant cost savings without compromising a remedy's protection of human health or the environment or reliability. Today, as one of these Reforms, I am announcing the formation of the National Superfund Remedy Review Board.

DISCUSSION

By establishing this Board, I intend to help control remedy costs by providing a cross-Regional management-level review of high cost (and thus, potentially controversial) decisions in "real time" on a site-specific basis.

Board Structure and Function

This national Review Board will be comprised of senior Agency managers or experts on remedy selection, cost effectiveness, and program implementation from both the Regions and Headquarters. Each Region will have one management-level representative on the Board. Headquarters representatives will include national experts from the Federal Facilities Restoration and Reuse Office, the Technology Innovation Office, the Office of General Counsel, ORD's National Risk Management Research Laboratory, and the Office of Emergency and Remedial Response (OERR). Other Offices may be requested to participate as the need arises. The Board will be chaired by Bruce Means, Senior Process Manager for Response Decisions in OERR.

All proposed cleanup actions at sites where: (1) estimated costs for the preferred alternative are over $30M; or (2) proposed remedy costs are over $10M ***and*** 50% greater than the costs of the least-costly, protective, ARAR-compliant remedy will be subject to the Board's review. As other cost control "rules of thumb" are developed (under a separate Administrative Reform), these "guides" may also be used to signal the need for this Board's review. My overall expectation, based on previous ROD history, is that this program should result in Board review of approximately 10% of FY96 actions.

The Review Board will consider the nature of the site, the risks posed by the site, regional and state/tribal opinions on proposed actions, the quality and reasonableness of the cost estimates, and any other relevant factors or program guidances in making "advisory recommendations" to the Regional Administrator regarding EPA's preferred remedy ***before a proposed plan is issued for public comment.*** The overall goal of the reviews will be to ensure sound decision making consistent with current law, regulations, and guidance. The Board's reviews will be performed quickly but will require advanced planning by the Region to account for the added review time. Remedies subject to Board review should be brought to the Board's attention as soon as the Region has identified them as likely 'preferred alternatives,' but in any case before the proposed plan is announced for public comment. Regions are encouraged to coordinate with OERR Regional Service Center Coordinators as early as possible in the process.

Especially since we are operating under a greatly reduced budget this year, I am sensitive to the likely increase in workload for you and your staff. This new Board will require additional work for us all and may briefly delay release of a small number of proposed plans by about two months, For these reasons, the Board will work to establish a review process that requires a minimum of travel and effort for Board participants. The Board is likely to form standing subgroups, based upon geography, expertise or workload. Reviews are likely to involve the faxing of relevant materials to subgroups for discussion by conference call after a brief review period. Details will be developed further as part of the Board's initial organizing discussions.

The Board is expected to be fully operational by January 1996. However, proposed remedies planned for issuance in the first quarter of FY '96 which meet the screening criteria noted above should also be discussed with my office.

Key Messages

By establishing this Board, I want to encourage decision makers to think even harder about the costs of response actions at every Superfund site.

However, this effort does not change the Agency's delegation authorities or alter in any way the public's current role in site decisions. This current effort is intended to facilitate the application of our national program's extensive experience to a select number of "high stakes" and thus, potentially controversial site decisions.

IMPLEMENTATION

If you have not already done so, please send your nominations for Board membership by December 8, to Bruce Means at (703) 603-8815; FAX: (703) 603-9103; Mail code (5204G). We have already welcomed the nominations of Walter Graham (Region 3), Wendy Carney (Region 5), Bill Honker (Region 6), and Wayne Pierre (Region 10). Bruce will be contacting your representatives shortly to schedule an introductory conference call later this month. For your information, Attachments A and B present an overview of the Board's tentative start up schedule and member- ship, respectively. I expect the Board to be up and running by the ***beginning of January 1996.***

I recognize that this additional review for the sites that exceed these cost control triggers may briefly delay the release of proposed plans. However, it is critically important to the Agency that we provide both the public and Congress the necessary assurances that Superfund dollars are being well spent. This Board will do much to provide those assurances.

Thank you for your prompt attention to this important matter.

Attachments

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cc:   Regional Administrators
      Steve Herman, OECA
      Bob Huggett, ORD
      Jon Cannon, OGC
      Romona Trovato, ORIA
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Attachment A

National Superfund Remedy Review Board
Tentative Start-Up Schedule
(11/20/95)

October/November

- Analyze past RODs meeting trigger criteria to examine trends.

- Issue memorandum to Regions announcing the Board kickoff.

- Complete membership list.

December

- Initial meeting/conference call to introduce concepts, discuss possible charter, operations/workflow models, roles.

- Develop/revise charter; determine need for additional Regional/HQ members/contacts.

January

- Fully operational.

Attachment B

National Superfund Remedy Review Board
Proposed Membership
(11/20/95)

Region 1 -- TBD
Region 2 -- John Frisco
Region 3 -- Walter Graham
Region 4 -- TBD
Region 5 -- Wendy carney
Region 6 -- Bill Honker
Region 7 –- TBD
Region 8 –- TBD
Region 9 -- TBD
Region 10 -- Wayne Pierre

OERR - Bruce Means
ORD/National Risk management Research Lab - TBD
FFRRO - Jim Woolford
OGC - TBD
OSWER/TIO - TBD
Other Offices may be invited to participate as needed.

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United Stated Environmental Protection Agency	Office of Emergency and Remedial Response (5204G)	EPA 540-R-97-032 OSWER 9220.0-26 February 1998

Superfund

National Remedy Review Board

Progress Report
Fiscal Year 1997

NRRB Progress Report 1997

Introduction

EPA created the National Remedy Review Board (the Board) in November 1995 as part of a comprehensive package of reforms designed to make the Superfund program faster, fairer, and more efficient. This report is the second annual report on the Board's progress. It focuses on significant accomplishments for the fiscal year (FY) ending September 30, 1997. However, it also presents information not publicly available when the Board issued its1996 report, as well as information on several Board reviews conducted in the first quarter of FY 1998. The report notes this where appropriate. This report should help those interested in the Board's work learn more about the review process, its contribution to the Superfund program, and the how interested parties can contribute to review efforts.

EPA believes the Board has accomplished a great deal this past year. The reviews have contributed to a more cost effective, consistent Superfund program, improved the quality of several high-cost cleanup decisions, and contributed positively to human health and environmental protection. In addition, FY 1997 Board recommendations may result in potential site cleanup cost savings of more than $6 million, bringing the cumulative reduction in estimated cleanup costs to over $37 million. The Board expects these savings estimates to increase as Regions complete their analyses of Board comments and issue proposed plans in the coming months.

The next section describes the Superfund reform initiative and explains how the Board contributes to it’s goals. The following sections discuss the Board’s operations, refinements, influence on Superfund cleanups, and resource issues. Included as attachments to this report are several EPA documents and memoranda that provide information about Board operating procedures, cleanup decision reviews, and other issues. Note that several Board operating procedures have changed in the past year. Please refer to the section titled “NRRB Operating Improvements” for an explanation of these changes.

EPA’s Superfund Reforms

The Superfund program is an ambitious and complex program that protects citizens and the environment from the dangers of abandoned or uncontrolled hazardous waste sites. When Congress enacted CERCLA[1] (the Superfund law) in 1980, the challenge of cleaning up what was assumed to be a few hundred discrete, land- based cleanups appeared relatively straightforward. The problem of neglected hazardous waste sites, however, has revealed itself to be far more complicated and widespread than anyone at first realized. EPA now recognizes that the number and complexity of hazardous waste sites across the nation dwarfs original estimates.

As a logical outgrowth of it’s experience managing the Superfund program, EPA has

1 Superfund is authorized by the Comprehensive Environmental Response, and Comprehensive, and Liability Act (CERCLA), as amended. 42 U.S.C. § 9601 et. seq. The program’s principal implementing regulation is the National Oil and Hazardous Substances Pollution Contingency Plan, also known as the NCP40 CFR 300.

put in place a series of Superfund reforms. These reforms change substantively the way the agency handles its responsibilities within existing laws. The reforms accelerate the pace and reduce the cost of cleanups, streamline remedy selection, increase fairness, promote economic redevelopment, and better integrate federal and state cleanup programs. These changes, however, do not alter the law's preference that Superfund cleanups provide long-term reliability and reduce the toxicity, mobility, or volume of waste through treatment. The Agency believes these reforms will save money without sacrificing public health or environmental protection. One of the principal program reforms is the National Remedy Review Board.

The National Remedy Review Board

The Board has fully operational since January 1996. Its goal is to review proposed high cost cleanup decisions to assure that they are cost effective and consistent with current law, regulations, and guidance.

The Board generally meets quarterly to review the proposed cleanup decisions that meet its cost-based review criteria. The Board is essentially a peer-review group that understands both the regional and Headquarters perspectives in the remedy selection process. The product of the review is a memorandum sent from the Board Chair to the appropriate Regional decision maker. This memorandum documents Board recommendations about the proposed cleanup strategy.

The Board is composed of managers or senior technical experts from each EPA Region, as well as senior technical or policy experts from EPA offices important to Superfund remedy selection issues. This membership ensures that the Board adopts a cross-Regional perspective when it examines key issues. It also provides for senior policy and technical input from EPA Headquarters and Laboratories. Offices represented on the Board include the Office of Emergency and Remedial Response (OERR), Office of Research and Development, Technology Innovation Office, Office of Indoor Air and Radiation, Federal Facilities Restoration and Reuse Office, and Office of General Counsel. The Board is Chaired by Bruce Means, Senior Process Manager for Response Decisions in OERR. See Attachment 2 for a list of Board members.

FY 1997 Board Reviews

The Board reviewed eight cleanup decisions in FY 1997 and three cleanup decisions in the first quarter of FY 1998, bringing the total number of reviews as of January 1998 to 23. In all cases, the Regions conduct analyses to decide whether and to what extent the reviews may ultimately affect their cleanup approaches. Table 1 presents summary information on each cleanup decision the Board has reviewed from its inception to January 1998.

Please note that EPA Regions are still considering Board recommendations on several cleanup decisions, particularly those conducted most recently. EPA Regions, however, have already estimated cleanup cost reductions of more than $6 million from FY 1997 reviews. Since the Board began its reviews in early 1996, EPA estimates total cleanup cost reductions of more than $37 million. The Board fully expects these savings estimates to increase as Regions complete their analyses of Board comments and issue proposed plans. Below are just two examples of how Board recommendations have contributed to significant cost savings since the Board last issued this report.

- The Board reviewed a cleanup decision for the New Bedford Harbor, Massachusetts, site in September 1996. One recommendation the NRRB made was for the Region to assess whether its air monitoring program was too extensive given the nature of the contaminants and planned cleanup actions. The Region subsequently analyzed the need for this continued monitoring and found that it could adjust the monitoring program and reduce costs by approximately $8.4 million.

- At the Tex Tin site in Texas, Board comments encouraged the Region to reassess how threats from a contaminated on-site building might best be addressed. As a result, the Region found a way to save approximately $6 million compared with its original proposal.

It is important to recognize that estimated cost reductions such as these do not reflect the full range of benefits gained from Board reviews. Other important benefits include greater scrutiny of cleanup costs, increased national consistency in remedy selection, improved technical analysis of promising cleanup strategies, better-articulated decision rationale at high cost sites, and increased confidence of Agency staff and stakeholders in the final remedy.

Board Review Criteria

The Board uses the following criteria to determine whether it will review a site. The Board will review all proposed Superfund cleanup decisions (final or interim final) for which: (1) the action costs more than $30 million; or (2) the action costs more than $10 million and this cost is 50% greater in cost than the least-costly, protective, cleanup alternative that complies with other laws or regulations “applicable” or “relevant and appropriate” to the site decision or action.

The criteria above cover federal facility sites with the following exceptions:

- For department of Energy sites where the primary contaminant is radioactive waste, the Board will review proposed cleanup decisions where: (1) the action costs more than $75 million; or (2) the action costs more than $25 million and this cost is 50% greater than that of the least costly, protective, cleanup alternative that complies with other laws or regulations “applicable” or “relevant and appropriate” to the site decision or action.

- The Board does not review proposed decisions for Base Realignment and Closure (BRAC) sites.

The Board, as of FY 1998, will also review all proposed non-federal facility non-time-critical removal actions (NTCRAs) estimated to cost more than $30 million..

The Board Review Process

As soon as the Region determines that a proposed action will trigger Board review, the RPM calls the state/tribe, potentially responsible party (PRP), and community group to notify them of the pending review and explain the review process. Approximately four weeks before the meeting, the RPM delivers to the Board the informational site package that the Board will use to conduct its review.

For each review, the Board meets in two stages: information-gathering and deliberations. The EPA site manager (Remedial Project Manager, or RPM) invites state and/or tribal representatives to participate in the information-gathering phase of the appropriate review. These representatives may participate in the deliberative discussion only for state/tribe-lead fund-financed decisions and state/tribe enforcement-lead decisions where the state/tribe seeks EPA concurrence. Otherwise, the Board limits its deliberative discussion to Agency personnel.

At the meeting, the RPM begins the information-gathering phase with a briefing that focuses on key remedy election selection issues. Following the RPM briefing, state and/or tribal representatives present their view of key issues. The Board generally responds with technical questions to clarify issues related to the site and proposed cleanup strategy. The Board may also discuss community, state/tribe, and/or PRP technical concerns in detail.

The Board then deliberates for several hours, focusing on whether the proposed cleanup decision is cost effective and otherwise consistent with the National Oil and Hazardous Substances Contingency Plan (NCP) and program guidance. The Board asks the RPM to attend the deliberation. The Board drafts its recommendations based on this discussion.

After the review, the Board transmits a memorandum from the Board Chair to the appropriate Regional decision maker. This memorandum documents any recommendations, advice, or findings the Board may have. Regional decision makers are then responsible for explaining, in a memorandum to the Board Chair, how the Region has considered the recommendations. The Region places both memoranda in the site's Administrative Record. Below are examples of the kind of recommendations the Board makes (excerpted from several recent Board memoranda):

- The NCP sets forth program expectations to treat principal threats wherever practicable. Another expectation is to contain low level threats, because treating these wastes may not be cost effective or practicable. The NCP also states that, for many sites, EPA will use a combination of treatment and containment. For this site, the information presented to the Board did not fully explain the extent to which the explosives-contaminated soils to be treated constitute principal threat wastes. The Board believes that less costly containment alternatives may be adequate for at least some of these materials, given the anticipated future land use and ground water considerations at the site. The [site managers] should further explore these alternatives or more thoroughly explaining the decision document its rationale for choosing treatment over containment.

- During remedial design it may be possible to take advantage of existing soil or hydrogeologic characteristics to refine and focus the extent or intensity of remediation work, and still achieve the desired remediation endpoints in a reasonable time frame. The Region should continue to examine key areas in more detail to refine the number of acres needing various levels of remediation to optimize the cost-effectiveness of the revegetation.

- The Board believes that there may be alternate (lower cost) approaches to constructing the proposed "Corrective Action Management Unit" in the lagoon area. For example, adequate dewatering and stabilization of the sludge may be achieved by surcharging the area to achieve load-bearing capacity, while adequate cap performance may be achieved using the surcharge soils and the proposed impermeable material. The Board recommends that the [site managers] evaluate the feasibility of this or similar approaches.

- The Board is concerned that the quarry may remain a long-term source of contamination to the shallow groundwater. The State should evaluate the appropriateness of ground water extraction near the quarry to reduce the potential for plume migration.

- [Site managers should]...require PRPs to address facility-specific contamination sources. Such action is important to reduce continued aquifer degradation and reduce the potential for future groundwater remediation efforts.

- The [site managers] should explain [their] rationale for addressing subsurface soil. This explanation should consider the potential for soil contamination as a continuing source of groundwater contamination, the exposure assumptions used in establishing preliminary remediation goals (for the protection of health and/or environmental effects), and the incremental costs associated with addressing subsurface soils.

NRRB Operating Improvements

This past year the Board conducted an extensive analysis of its operating procedures. The purpose was to respond to stakeholders concerns and to assess whether the Board could improve its performance given the experience gained in the first year. This including gathering and analyzing stakeholders comments and concern, working with EPA Headquarters and Regional management to assess Board performing, soliciting suggestions for improvements, and sometimes, holding intensive internal meetings to guarantee the Board was conducting efficient, effective reviews. The following section summarizes changes or refinements to the Board's operating procedures resulting from this work.

Non-Time Critical Removal Action (NTCRA) Reviews

Superfund removal actions can be cost-effective, efficient ways to address health or environmental threats. Consequently, EPA is using NTCRAs increasingly to carry out the relatively high-cost response actions and expedite cleanups at National Priorities List sites. To assure that these high cost NTCRA decisions are consistent with national policies and guidance, the Board will review all proposed non-federal facility NTCRAs estimated to cost more than $30 million. The review should occur before the Engineering Evaluation/Cost Analysis, (EE/CA) is issued for public comment. This review criterion is effective as of October 1, 1998.

EPA officials are currently working at the with DOE Headquarters and other federal agency officials to discuss Board review of federal facility NTCRAs. Until the Agency reaches an official agreement with its federal counterparts, the NRRB will not review NTCRAs at federal facility sites. High Cost

High Cost Sites that do not Trigger Review Criteria

The Board holds its reviews early in the cleanup process to take advantage of senior management and technical expertise before the Region finalizes its initial Proposed action for a site. During this phase of the decision making process, Regions develop initial cost estimates according to formal EPA cost estimating guidance. However, these estimates are preliminary and carry with them a range of uncertainty. The Board understands stakeholder interest in the quality and accuracy of these cost estimates because the estimates determine whether a site triggers Board review. In response to stakeholder concerns-the Board has adopted the following policy:

- For sites that are close to, but do not trigger, the $30 million cost criteria: the appropriate Regional Board member will discuss briefly with the Board the key remedy selection and cost issues at the site would benefit from Board review.

Post-Proposed Plan Cost Increases

The Board recognizes that marginal, post-proposed plan cost increases are not uncommon. The Board believe it is important, however, to review cleanup decisions that do not trigger review criteria at the proposed plan stage, but undergo significant cost increases after the region issues the proposed plan. Although the Board does not expect to deal with such a situation often, it has in place the following operational protocol.

- For proposed actions that did not originally trigger Board review, and the Region subsequently develops a new proposal that costs 20% more than the original cost estimate, and the costs trigger review criteria, then the Board will review the cleanup decision before ROD signature.

- Where the Board has already reviewed a proposed action and the Region subsequently develops a new proposal (or chooses a different alternative) that costs 20% more than the original preferred alternative, then the Board will review the proposed decision.

PRP and Community Technical Submissions to the Board.

In FY 1997, the Board doubled the page limit for PRP and community group submissions to 10 pages. The Board believes that 10 pages of technical comment, if it is focused on those issues relevant to the Board's discussions, is sufficient space to highlight any critical issues concerning remedy selection at the site.

TABLE 1: CUMULATIVE BOARD REVIEW SUMMARY

Site and Region	*Review Date*	*Decision Stage at Review*	*Board memo available to public**
Fernald OU-5, R5	January 1996	Post-pp	yes
Petrochem, R8	January 1996	Pw-PP	yes
Operating Industries, Inc., R9	January 1996	Pre-PP	yes
Fernald OU-3, R5	March 1996	Pre-PP	Yes
Coleman Evans, R4	May 1996	Post-pp	yes
Petroleum Products, R4	May 1996	Pre-pp	yes
Dupont Necco Park, R2	May 1996	Pre-PP	yes
Roebling Steel, R2	June 1996	Pre-pp	Yes
Jack's Creek, R3	June 1996	PM-PP	yes
Shipyard Sediments, R10	August 1996	Post-pp	yes
New Brigbton, R5	August 1996	Pre-pp	yes
New Bedford Harbor, RI	August 1996	Pre-pp	yes
Fietcber Paint, RI	November 1996	Pre-PP	yes
Tar Creek, R6	January 1997	Pre-PP	yes
Anaconda Smelter, R8	April 1997	Pre-PP	yes
Continental Steel, R-5	April 1997	Pre-PP	yes

Montrose/DelAmo, R9	April 1997	Pre-PP	pending
Nebraska Ordnance Plant, R7	July 1997	Post-ROD	yes
Oak Ridge National Lab, Surface Impoundment OU, R4	July 1997	Post-PP	yes
Tex Tin, R6	July 1997	Pre-PP	yes
San Gabriel, Puente Valley OU, R9	December 1997	Pre-PP	yes
Imn OU, R5	December 1997	Pre-PP	yes
Joliet Army Ammunition, R5	December 1997	Pre-PP	yes

*Please refer to attachment 6 for the full text of Board recommendatiors publicly available as of January 1998.
Key: R=Region, OU=operable unit, PP=proposed plan, ROD=Record of Decision

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND
EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: National Remedy Review Board Recommendations on the Coleman Evans Wood Preserving Site.

FROM: Bruce Means, Chair
National Remedy Review Board

TO: Richard D. Green, Acting Director
Waste Management Division
EPA Region 4

DATE STAMPED:
AUGUST 12 1996

Purpose

The purpose of this memorandum is to document the findings of the National Remedy Review Board (NRRB) on the proposed remedial action for the Coleman Evans Wood Preserving Site in Florida.

Background

As you recall, the Administrator established the NRRB as one of the October 1995, Superfund Administrative Reforms to help control remedy costs and promote consistent and cost-effective decisions. The Board will review all proposed cleanup actions where: (1) the estimated cost of the preferred alternative exceeds $30 million, or (2) the preferred alternative costs more than $10 million and is 50% more expensive than the least-costly, protective, ARAR-compliant alternative. In its review, the NRRB considers the nature and complexity of the site; health and environmental risks; the range of alternatives that address site risks; the quality and reasonableness of the cost estimates for alternatives; Regional, State/tribal, and other stakeholder opinions on the proposed actions (to the extent they are known at the time of review); and any other relevant factors or program guidance.

Generally, the NRRB makes “advisory recommendations” to the appropriate Regional decision maker before the Region issues the proposed plan. These recommendations are then to be included in the Administrative Record for the site. While the Region is expected to give the Board's recommendations substantial weight, other important factors, such as subsequent public comment or technical analyses of remedial options, may influence the final Regional decision. It is important to remember that the NRRB does not change the Agency's delegation authorities or alter in any way the public's current role in site decisions. This Reform is intended to focus the program's extensive experience on decisions at a select number of high stakes sites.

Findings

The NRRB met with the Regional and State Remedial Project Managers (RPMs) for the Coleman Evans Wood Preserving site on May 8, 1996. Based on that review and discussion, the members of the NRRB make the following observations.

The Board is in general agreement with the preferred cleanup approach (Alternative 4), which relies primarily upon thermal desorption to address remedial action objectives: preventing PCP leaching to groundwater, and mitigating direct human contact with or ingestion of dioxin. The remedy complies with the preference for treating principal threats stated in the National Contingency Plan, and complies generally with EPA's presumptive remedy guidance on treating soils at wood treater sites (OSWER Directive 9200.5-162). The Board supports cleaning up the site to levels indicated in the Region's proposal, which should allow unrestricted site use at an estimated cost of approximately $20 million.

The Board notes two areas of concern, however. First, although thermal desorption remains a viable option for addressing health threats at this site, the Board cautions that the technology may not effectively treat on-site soils to the cleanup levels identified by the Region. Second, the State of Florida provided information to the Region the day before the NRRB meeting that may substantially affect dioxin soil cleanup requirements. They informed the Region that a new State law considers dioxin soil levels greater than seven parts per trillion (ppt) to be unacceptable. Neither the NRRB nor the Region can, at this time, completely evaluate the relative merits and cost effectiveness of various cleanup options, since extent of contamination sampling at these levels has not been conducted.

Region 4 is currently evaluating whether this law constitutes an applicable or relevant and appropriate requirement (ARAR). Board members noted that the seven ppt dioxin cleanup level is generally inconsistent with several dioxin decisions at other sites. Further, the Board questions whether current treatment technologies, such as thermal desorption or incineration, can reach this level.

Given the concerns noted above, the NRRB recommends that Region 4:

- Work with the Florida Department of Environmental Protection to clarify the cleanup objectives and requirements for the contaminated soil and groundwater at the site with particular emphasis on the seven ppt dioxin ARAR issue.

- Conduct a pilot-scale study on the effectiveness of thermal desorption for treating PCP and dioxin-contaminated soils at the site.

- Explore the feasibility and cost of enhancing Alternative 2, containment, given the uncertainty in the potential effectiveness of thermal desorption and the Region's previous experience in evaluating other treatment options for site contamination. This enhancement may include, but would not be limited to, a combination cap and slurry wall or an above ground containment vault.

- Consider a hybrid alternative that would employ both treatment and containment of the same soils. The Region may find it more cost effective to use a treatment technology other than thermal desorption (e.g., bioremediation) to address the principal threat posed by PCP and high dioxin levels, followed by a less expensive containment system or barrier (e.g., soil cover) to prevent residual dioxin exposures.

- Further explore the feasibility of Alternative 3, incineration, which should be able to meet Regional remediation goals at only slightly higher estimated cost. The NRRB appreciates, however, that the Region must fully consider community and State concerns regarding the use of incineration at this site.

The NRRB appreciates the Region's efforts to work closely with the State and community to identify the current proposed remedy. The Board members also express their appreciation to both the Region and the State of Florida for their participation in the review process. We encourage Region 4 management and staff to work with their Regional NRRB representative and the Region 4/10 Regional Accelerated Response Center at Headquarters to discuss appropriate follow-up actions.

Please do not hesitate to give me a call if you have any questions at 703-603-8815.

cc: S. Luftig
E. Laws
T. Fields
B. Breen
J. Hankinson, Jr.
J. Cunningham

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND
EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: National Remedy Review Board Recommendations on the Tar Creek Superfund Site

FROM: Bruce K. Means, Chair
National Remedy Review Board

TO: Myron O. Knudson, Director
Superfund Division
EPA Region 6

DATE STAMPED:
MARCH 4 1997

Purpose

The National Remedy Review Board (NRRB has completed its review of the proposed remedial action for the Tar Creek Superfund site in Ottawa County, Oklahoma. This memorandum documents the NRRB's advisory recommendations.

Context for NRRB Review

As you recall, the Administrator announced the NRRB as one of the October 1995, Superfund Administrative Reforms to help control remedy costs and promote consistent and cost-effective decisions. The NRRB furthers these goals by providing a cross-regional, management-level, "real time" review of high cost (and thus potentially controversial) proposed response actions. The Board will review all proposed cleanup actions where: (1) the estimated cost of the preferred alternative exceeds $30 million, or (2) the preferred alternative costs more than $10 million and is 50% more expensive than the least-costly, protective, ARAR-compliant alternative. The NRRB review evaluates the proposed actions for consistency with the National Contingency Plan and relevant Superfund policy and guidance. It focuses on the nature and complexity of the site; health and environmental risks; the range of alternatives that address site risks; the quality and reasonableness of the cost estimates for alternatives; Regional, State/tribal, and other stakeholder opinions on the proposed actions (to the extent they are known at the time of review); and any other relevant factors.

Generally, the NRRB makes "advisory recommendations” to the appropriate Regional decision maker before the Region issues the proposed plan. The Region will then include these recommendations in the Administrative Record for the site. While the Region is expected to give the Board's recommendations substantial weight, other important factors, such as subsequent public comment or technical analyses of remedial options, may influence the final Regional decision. It is important to remember that the NRRB does not change the Agency's current delegations or alter in any way the public's role in site decisions.

NRRB Advisory Recommendations

The NRRB reviewed the package for the residential properties operable unit at the Tar Creek site and discussed related issues with EPA Remedial Project Manager Noel Bennett and Toxicologist Ghassan Khoury; Oklahoma Department of Environmental Quality representatives Monty Elder and Kelly Dixon; InterTribal Environmental Council representative Kent Curtis; and Quapaw Tribe representative John Gault on January 28, 1997. Based on this review and discussion, the NRRB generally supports the Region's preferred alternative. In addition, the Board makes the following comments and recommendations for the Region's consideration.

- Given the widespread distribution of chat mining wastes throughout the community and the resulting potential for multiple pathway exposures, the Board recommends that the Region clarify the relationship of this action to future actions the Region may take to address remaining contamination at the site (e.g., chat piles, tailings ponds, undeveloped land, industrial properties, etc.).

- In view of this contamination and uncertainties in implementing the remedy (e.g., the ability to secure access to all contaminated residential properties), community protective measures are likely to play an important supplemental role at this site in protecting human health. The Region should therefore include in the preferred alternative (Alternative 2 in the proposed plan) the provisions for counseling and public education (e.g., emphasizing proper personal hygiene and the importance of removing indoor dust).

- The Region should make it clear to residents that there may be a residual indoor dust threat following soil excavation, that normal household cleaning will reduce the contamination to a protective level, and that the Region will loan HEPA vacuums to residents to expedite this process, if this service is not provided by others.

- The Region should encourage the Bureau of Indian Affairs and the State to address potential recontamination sources (e.g., to control redistribution of chat around residences, potential deterioration of exterior lead-based paint, etc.).

- Given the preliminary results of a recent blood lead study that indicate a significant portion of the children in the Tar Creek area already experience elevated blood lead levels, the Board encourages continued blood lead monitoring of children through the State and local health agencies. Such monitoring would help local public health officials track the overall success of multi jurisdictional efforts to reduce childhood lead exposures in Tar Creek.

The NRRB appreciates the Region's efforts to work closely with the State, Indian Tribes, and the community to identify the current proposed remedy. The Board members also express their appreciation to the Region, the State of Oklahoma, the InterTribal Environmental Council, and the Quapaw Tribe for their participation in the review process. We encourage Region 6 management and staff to work with their Regional NRRB representative and the Region 2/6 Accelerated Response Center at Headquarters to discuss appropriate follow-up actions.

Please do not hesitate to give me a call if you have any questions at 703-603-8815.

cc: J. Saginaw
S. Luftig
E. Laws
T. Fields
E. Shaw

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND
EMERGENCY RESPONSE

MEMORANDUM

SUBJECT: Review of Non-Time-Critical Removal Actions by the National Remedy Review Board

FROM: Stephen D. Luftig, Director /S/ DEC 18 1997, Office of Emergency and Remedial Response

TO: Director, Office of Site Remediation and Restoration, Region I

Director, Emergency and Remedial Response Division, Region II

Director, Hazardous Waste Management Division, Regions III, IX

Director, Waste Management Division, Region IV

Director, Superfund Division, Regions V, VI, VII

Assistant Regional Administrator, Office of Ecosystems Protection and Remediation, Region VIII

Director, Environmental Cleanup Office, Region X

Regional Counsels, Regions I - X

DATE STAMP:
DEC 18 1997

Purpose

The purpose of this memorandum is to notify you that the National Remedy Review Board (NRRB) will be reviewing proposed non-time-critical removal action (NTCRA) decisions beginning in FY 1998. The NRRB will review all proposed NTCRAs for sites at fund- and enforcement-lead NPL sites where costs for the preferred action are estimated to exceed $30 million. While Federal facilities have full authority for NTCRAs at their sites, the Office of Emergency and Remedial Response (OERR), the Federal Facilities

Restoration and Reuse Office (FFRRO), and the Federal Facilities Enforcement Office (FFEO) are working together with other Federal agencies to determine how best to consider expensive proposed decisions at Federal facility sites. Until agreements are reached with appropriate Federal agency officials, the NRRB will not review NTCRAs for Federal facility sites.

I ask that you please forward this notice to the appropriate Regional contacts for implementation.

Background

As you know, the Office of Solid Waste and Emergency Response established the NRRB in October 1995 as one of Administrator Browner's Superfund Reform initiatives. The Board's goals are to help control remedy costs and promote both consistent and cost-effective decisions at Superfund sites, including those at Federal facilities.

The Board reviews proposed decisions when the following criteria are exceeded: (1) estimated costs for the preferred alternative exceed $30 million; or (2) proposed remedy costs exceed $10 million and they are 50% greater then than those of the least-costly, protective, ARAR-compliant alternative. These criteria have triggered Board review of 23 remedial actions representing all ten Regions in the last two years.

As a result of implementation of the Superfund Accelerated Response Model (SACM) and recent Reform efforts, many Superfund managers have looked to the removal program for ways to expedite site cleanup. Since removal actions often provide excellent, cost-effective tools for quick response to pressing health or environmental threats, NTCRAs are being used more than they were in the past to carry out relatively high-cost response actions. Given this increased role for NTCRAs in costly site cleanups, I believe it is prudent to extend the NRRB program for review of high cost decisions to these actions as well.

Discussion

Generally, we do not believe there will be many high cost NTCRAs. In fact, most NTCRAs are likely to cost less than $5 million. However, I believe it is important to review a portion of Superfund's NTCRAs in order to provide the necessary assurances that our decisions are consistent with national policies and guidance. With this in mind, I ask that you submit all proposed NTCRAs that are estimated to cost more than $30 million to the NRRB for review. This review should occur before the Engineering Evaluation/Cost Analysis (EE/CA) is issued for public comment.

The Board will review information packages for NTCRAs similar to those reviewed for high cost remedial actions. In doing so, the NRRB will consider the nature of the site; the risks posed; the response actions considered with associated costs; Regional, PRP, State/Tribal, and community opinions on the proposed action (to the extent they are known at the time); and any other relevant factors or program guidance in making advisory recommendations to the Regional decision maker. The Region, in turn, is asked to respond in writing to these recommendations. Both the NRRB recommendations and the Regional response will become part of the site Administrative record.

I fully appreciate that the timing and coordination of proposed NTCRAs with other ongoing cleanup activity will often be critically important. As a result, I expect the NRRB to make every effort to provide the review within a satisfactory timeframe. However, it is incumbent on the Regions to make sure that parties bring the actions triggering review to the Board as soon as possible. This will likely require advanced planning by the Regions and others to account for the NRRB review time (i.e., about 8 weeks). I recognize that many NTCRAs are led by PRPs, State/Tribes, or Federal facilities; thus, the planning process should consider the time required both to coordinate with and solicit input from relevant stakeholders, and the time for concurrence in enforcement actions. Generally, stakeholders are invited to participate in the review of NTCRAs in the same manner as for remedial actions. Please talk with your Regional NRRB representative for more details.

As you know, while in some cases EPA works very closely with other Federal agencies in site remediation, in general, Federal facilities have full authority to conduct NTCRAs at their sites. For this reason, OERR, FFRRO, and FFEO are working together with other Federal agency officials to determine how best to consider expensive proposed decisions at Federal facility sites. It should be noted that a recent EPA memorandum on the Final FY 1998 Superfund Reforms Strategy (dated November 13, 1997) indicated that NTCRAs at Federal facility sites (other than BRAC sites) that are estimated to cost more than $30 million (or $75 million for Department of Energy (DOE) radioactive waste sites) are expected to be reviewed by the NRRB in FY '98. Recently, however, EPA officials met with DOE Headquarters and other Federal agency officials to discuss the NRRB review of NTCRAs in more detail. As a result, EPA and DOE have agreed to work together to explore additional options for NRRB involvement. Dialogue also continues between EPA and the other Federal agencies. Therefore, until an official agreement is reached with other Federal agency officials, the NRRB will not review NTCRAs at Federal facility sites.

Implementation

Effective immediately, please identify for NRRB review all proposed NTCRAs at sites other than Federal facility sites that are estimated to cost more than $30 million. Your Regional NRRB representative will work with appropriate managers and staff to address relevant site-specific questions about timing and review materials, and to establish a review schedule that minimizes potential for pipeline delays.

I believe that this Reform has accomplished much to improve both the consistency and cost effectiveness of our cleanup decisions over the last two years. Indeed, the NRRB has been well received by a wide range of stakeholders and is likely to play a significant role in a reauthorized Superfund. Without question, this reform's success is the direct result of the hard work of your staff and management. We greatly appreciate these efforts and look forward to your continued support in the review of NTCRAs.
Please contact me, or Bruce Means, NRRB Chair, (703-603-8815), if you have any questions or comments.

cc: T. Fields

OERR Center Directors

OERR Senior Process Managers

B. Breen

J. Woolford

E. Salo

E. Cotsworth

W. Kovalic

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National Remedy Review Board Members

United States Environmental Protection Agency | Office of Solid Waste and Emergency Response | Publication 9360.0-46FS
EPA540-F-93-020
April 1993

Presumptive Remedies:

Technology Selection Guide for Wood Treater Sites

Office of Emergency and Remedial Response
Emergency Response Division 5202G
Quick Reference Fact Sheet

Since the enactment of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) in 1980, the Superfund remedial and removal programs have found that certain site categories have similar characteristics, such as types of contaminants present; types of disposal practices, or how environmental media are affected. Based on information acquired from evaluating and cleaning up many of these sites, Superfund is undertaking an initiative to develop presumptive remedies that are appropriate for specific types of sites and that are designed to accelerate the Superfund cleanup process. The objective of the presumptive remedies initiative is to draw upon past experiences to streamline site investigations and the remedy selection process in accordance with the Superfund Accelerated Cleanup Model (SACM). The Agency has developed presumptions that particular technologies are appropriate for certain types of sites by evaluating technologies that have been consistently selected and successfully used for past sites.

The Agency is developing a Generic Presumptive Remedies fact sheet which will outline and address the common issues (e g., use of risk assessment, innovative technologies, how to rebut the presumptive remedy, etc.) anticipated with the use of a presumptive remedy at any site. In addition, the Agency is developing guidance on presumptive remedies for soils contaminated by volatile organic compounds, municipal landfills, polychlorinatedbyphenols, grain storage, coal gasification sites, and contaminated ground water.

Information on technology performance for wood treater sites is presented in this **Technology Selection Guide**, it will be supplemented by additional analyses of previous remedy selection decisions and remedy performance This additional analyses will be developed into a **Presumptive Remedy Guide**. This document is intended for use by a decision-making team experienced with wood treater sites.

BACKGROUND

Abandoned wood treater sites typically contain the following contaminants either alone or in combination with each other or with total petroleum hydrocarbon (TPH) carrier oils: creosote (mainly, polynuclear aromatic hydrocarbons (PAHs)); pentachlorophenol (PCP);.and chromated copper arsenate (CCA). These contaminants may be found in pure form (product), or in sludge, soil, sediments, surface waters, or ground water. Light Non-Aqueous Phase Liquids (LNAPLs) and Dense NAPLs (DNAPLs) may also be present in surface or ground water.

Removal and remedial program experience at full-scale projects indicates that there are some demonstrated treatment technologies capable of achieving defined clean-up goals at wood treater sites These technologies are presented in this guide, in addition, other technologies, with limited performance data, are also presented here.

IMPLEMENTATION

Choosing among remedies requires care to match treatment requirements with site specific conditions, but the process can be streamlined within the scope of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) remedy selection requirements. A focused site evaluation by experienced personnel with the use of the guide can greatly limit the feasible treatment options, identify early actions, and expedite the clean-up process. This guide provides a selection procedure outline (box below) and practical considerations for the facilitation of remedy selection. In addition, three tables are included in the guide: Table I, Technologies for Treatment of Sludge, Soil, and Sediment; Table II, Technologies for Treatment of Surface Water and Ground Water; and Table III, Information Needs and Process Limitations. Many of the tasks outlined in this guide can and should be conducted simultaneously to accelerate the process and to minimize cost; however, a sequential process may be necessary at times.

WOOD TREATER TECHNOLOGY SELECTION PROCEDURE OUTLINE

Site Characteristic

A. Identify Contaminant
   1. Type (i.e., CCA, PCP, creosote, or TPH
   2. Alone or mixed (e.g., PCP/creosote/CCA)
B. Establish Site Screening Criteria[1] Based an Actual or Anticipated Land and Water Uses
C. Identify Media and Areas Needing Treatment:
   1. Product (drums, tanks, or recoverable NAPLs)
   2. Sludge (drums, tanks, or open buried lagoons)
   3. Soil and sediments from:
      a. process areas
      b. drip areas and storage areas
      c. lagoon or drainage areas (on-site/off-site)
   4. Surface Water
      a. ponds/lagoons
      b. runoff or drainage pathways
   5. Ground Water
D. Identify Possible Treatment Options (Table I and II) (include treatability studies for non-demonstrated technologies)
E. Determine Extent, Volume, and Level of Contamination in Each Medium and Area of Concern
F. Characterize Broadly the Physical/Chemical Nature of Each Treatment Medium in View of the Possible Treatments (Table III Identifies Additional Information Needs):
   1. Solids - Particle Size Distribution/ pH/Total Organic Carbon (TOC/Cation Exchange Capacity/Moisture
   2. Liquids - Phases/pH/TOC
   3. Sludge - TOC/Moisture/Pumping Characteristics
G. Select Final Clean-up Goals and Treatment Levels[1] Considering Anticipated Land and Water Uses and the Removal Efficiencies Required to Achieve Those Levels

WOOD TREATER TECHNOLOGY SELECTION PROCEDURE OUTLINE
(continued)

Treatment Selection

A. Confirm the Volumes, Matrix Homogeneity and Consistency, and Contaminant Concentrations
B. Evaluate On/Off-Site and Pre-Treatment Options
C. Evaluate Capping/Containment Option
D. Assess Excavation, Segregation, and Stockpiling
E. Select Candidate Treatment Options (Tables I and II)
F. Evaluate Treatment Limitations and Information Needs Using Table III
G. Select Final Treatments and Perform Site Specific Treatability Studies to Obtain Design Data for Procurement Specification

[1]Site Screening Criteria are operational, such as action levels resulting from an exposure risk assessment for a specific land use; they trigger the need for clean-up. Clean-up Goals and Treatment Levels reflect projected exposure for particular land uses; these levels describe the suitability of a resource for its intended use.

PRACTICAL CONSIDERATIONS FOR FACILITATING TECHNOLOGY SELECTION

1. If the product is still in original containers it should be returned to the manufacturer. Reuse of material (i.e., process liquids) and relocation of equipment to other permitted facilities should be considered Phase separation should be conducted; water and emulsified product could be treated on site. LNAPLs and DNAPLs may or may not be recyclable depending on the purity of the recovered phase.

2. Where any of the principal wood treating chemicals (creosote, PCP, or CCA) can be recovered in high enough concentrations to warrant reuse in any process, recycling becomes the preferred technology. The recognized Waste Exchanges are listed in Appendix A. The alternative to reuse or recycling is to treat the material as waste along with other contaminated liquids or solids.

3. If the product, (e.g , PCP), is in storage tanks, then it should be analyzed for cross contaminants such as dioxins/furans. Total pumpable and non-pumpable sludge in tanks and drums should also be determined.

4. Site characterization should proceed as a single, multimedia sampling event whenever possible. Field screening methods should be integrated into the sampling and analysis plan in order to accelerate information gathering. Data quality objectives must reflect the ultimate use of the results, but all samples taken during a single event may not require the same level of data quality.

5. Site preparation and bulk material handling needs require evaluation wherever soil treatment is being considered. Pretreatment renders a material suitable as feed for a treatment process. The technology selection should be evaluated for consistency with the overall remedy for the site. Site preparation and pretreatment activities include but are not limited to the following:

A. Site Stabilization
1. Fencing and security
2. Capture and treatment of runoff
3. Containment of leaking vessels
4. Use of liners and covers
5. Capping and containment
6. Evaluation of on-site pretreatment for off-site disposal

B. Material Handling, Waste Segregation, and Pretreatment
1. Surface material removal (poles, tanks, buildings, product, etc.)
2. Excavation & stockpiling
3. Sizing
   a. Screening of inert and oversized materials
   b. Particle fractionation or hydrosieving
   c. Debris handling
4. Chemical pretreatment or Sterilization

6. In general, other than in processing areas and storage tanks, the highest concentrations of contaminants may be found in surface and buried waste lagoons. Contamination can migrate vertically from these lagoons to significant depths. Hydrogeologic studies may be necessary to discern such contamination and additional technologies for remediation may have to be considered.

7. Surface lagoons, soil areas, drip pads, and sediments should be gridded and sampled to determine the horizontal and vertical extent of contamination. Soil and sludge characterization relevant to treatment selection should reflect the information needs detailed in Table III.

8. Excavation of contaminated soil should generally not be done until the final treatment technology has been selected, except where it is deemed necessary to reduce an imminent hazard or to control migration. Where possible, excavated organic and inorganic contaminants, and high and low concentration materials should be staged separately.

9. It is usually too expensive to ship quantities of greater than 5,000 cubic yards of contaminated soil off-site for disposal. Pretreatment of soil and water may be required prior to shipment or discharge to another treatment facility.

10. Circumstances may arise where capping and containment of material with relatively low toxicity and mobility is an appropriate remedy. Such instances will require careful evaluation.

11. Representative sampling and analysis for verification of expected treatment efficiencies should be consistent with accepted Superfund quality assurance/quality control guidance.

12. Health and safety, considerations enter into the technology selection process as described in the Health and Safety Plan (HASP). Air monitoring to support the HASP includes both on-site and off-site components.

TABLE I

Technologies for Treatment of Sludge, Soils, and Sediment

Contaminant	Treatment Technologies	Treatability (RREL Database)[3]	Treatment Trains[4]
CCA	Immobilization[1]	80 - 90%TCLP (B.P.F)	Soil Washing/ Immob[2]
PCP	Incineration[1] Other Thermal Treatment[2] Biotreatment[2] Dechlorination[2]	90 - 99% (B.P.F) ! ! ! ! ! ! ! ! !	! ! ! Soil Washing/Bio[2] ! ! ! ! ! !
Creosote	Incineration1 Other Thermal Treatment Biotreatment[2]	90 - 99% (B,P,F) ! ! ! ! ! !	! ! ! Soil Washing/Bio[2]
PCP + Creosote	Inceneration[1] Other Thermal Treatment[2] Biotreatment[2]	95 - 99% (B,P,F) ! ! ! ! ! !	! ! ! Soil Washing/Bio[2]
Creosote + CCA	NA	4	Incin/Immob Ash[1] Soil Washing/Bio/ Imob[2]
PCP + CCA	NA	4	Incin/Immob As[h] Soil Washing/Bio/ Imob[2] Dechlorin/Immob[2]

1. This technology recommendation assumes that the specified treatment efficiency can be achieved for a given site; it assumes that no site-specific constraints exist

2. Them other technologies may warrant site-specific evaluation, RI/FSs, focused feasibility studies (FFSs), or engineering evaluations/cost analyses (EE/CAs) because they lack full-scale performance data. Site-specific conditions also may favor a subset of the major technology. Bench-scale and for pilot studies may be necessary to refute the selection of the most appropriate specific treatment method.

3. Performance data are from the Risk Reduction Engineering Laboratory (RREL). The database is derived from bench scale (B), pilot scale (P), or full scale (F) demonstration projects. Dashes indicate insufficient data. The RREL is updated on a regular basis and is available through the Alternative Treatment Technology Information Center (ATTIC),

4. Performance efficiency for treatment trains is a function of contaminant concentration, matrix and volume. It can generally be presumed that the performance of treatment trains will equal or exceed that of the individual treatment technologies.

TABLE II

Technologies for Treatment of Surface Water and Groundwater

Contaminant	Treatment Technologies	Treatability (RREL Database)*	Treatment Trains
CCA	Precipitation Reverse Osmosis Ion Exchange	97 - 99% (B,P,F) 99% (P) ! ! !	Presip/Immob Precip/RO/Immob Precip/Ion Ex/Immob
PCP	Carbon Treatment Biotreatment Oxidation	95 - 99% (p) 99% (B,P,F) 99% (B,P)	Phase Sep/Carb Phase Sep/Bio Phase Sep/Oxidation
Creosote	Carbon Treatment Biotereatment Oxidation	82 - 99% (P,F) 99% (P,F) 99% (B,P)	Phase Sep/Carb Phase Sep/Bio Phase Sep/Oxidation
PCP + Creosote	Carbon Treatment Biotereatment Oxidation	82 - 99% (P,F) 99% (B,P,F) 99% (B,P)	Phase Sep/Carb Phase Sep/Bio Phase Sep/Oxidation
Creosote + CCA	Carbon Treatment Oxidation Precipitation	! ! !	Phase Sep/Treat Organic/Treat Metals
PCP + CCA	Carbon Treatment Oxidation Precipitation	! ! !	Phase Sep/Treat Organic/Treat Metals

KEY Treat Organic = Carbon Treatment or Chemical (O_3, ClO_2, H_2O_2) or Ultraviolet Oxidation

Treat Metals = Reverse Osmosis or Ion Exchange or Chemical Precipitation and Immobilization of Residues

C Performance data from the RREL (Risk Reduction Engineering Laboratory). Database is derived from bench scale (B), pilot scale (P), or full scale (F) demonstration projects. Dashes in the table indicate insufficient data.

TABLE III

Information Needs and Process Limitations

Treatment Technology	Information Needs	Process Constraints and Limitations
Thermal Treatment - Incineration	i) BTU value ii) Volatile metals concs. iii) Alkali metals (Na,K) cons iv) Elemental analysis (N,S,P,Cl, etc.) v) Moisture content vi) Pumping chars. And viscosity	i) High moisture content ii) High alkali metals soil iii) Elevated levels of mercury, organic phosphorus iv) Volume <3000-5000 cu-yds
Thermal Treatment-Description	i) Melting and boiling points ii) Volatile metals concs. iii) Flash points iv) Elemental analysis (N,S,P,Cl,etc.) v) Vapor pressures vi) Optimum desorption and Destruction temperatures vii) Moisture content	i) High boiling points over 500EF (260EC) ii) Elevated levels of halogenated organs iii) Presence of mercury iv) Corrosivity
Immobilization	i) TOC (oils, TPH, human material, ii) Grain size distribution iii) Soluble slats iv) Cation Exchange Capacity (CEC)	i) TPH >1% ii) Humic matter <20%
Biotreatment-In-situ	i) Indigenous microorganisms ii) Degradation rates iii) Solubility iv) Nutrient requirements and existing conditions of pH, temp., oxygen, moisture, etc. v) Depth to ground water and thickness of contaminated zone vi) Permeability of the soil	i) Toxic metals, chlorinated organics, pH outside 4.5-9, limiting growth factors ii) Ambient temp. below 15EC iii) Short time/growth season iv) Rainfall/evapotranspiration rate/percolation rate ratios too high or too low v) Limiting initial and final concs.
Biotreatment-Ex-situ	i) Indigenous microorganisms ii) Degradation rates iii) Solubility iv) Nutrient requirements and existing conditions of pH, temp, oxygen, moisture, etc.	i) Lack of indigenous microbes ii) Toxic metals, highly Chlorinated organics, pH Outside 4.5-9, limiting growth factors iii) See also "In-situ", above
Base-Catalyzed Dechlorination	i) Heavy metals conc. ii) Reactivity at high pH iii) Elemental analysis (N,P,S,Cl, etc.) iv) Redox potential v) TOC, humanic material and clay content	i) Heavy metals and excess soil moisture (>20%) may require special treatment ii) High organic and clay content may extend reaction time
Soil Washing	i) Solubilities and partial coefficients ii) Grain size distribution iii) TOC and humic material content iv) Cation Exchange Capacity (CEC)	i) High hydrophobic TOC and humic material content inhibits detergency ii) >30% silt and clay particles cancels out volume reduction benefit of process iii) Surfactant solutions may cause operating problems

REFERENCES

Contaminants and Remedial Options at Wood Preserving Sites, USEPA, ORD, RREL, September 1992

Approaches for Remediation of Uncontrolled Wood Preserving Sites, EPA/625/7-90/011, USEPA Office of Environmental Research Information, Cincinnati, OH 45268, November 1990

"Creosote Contaminated Sites-Their potential for bioremediation, "Environmental Science & Technology, Vol. 23, No. 10, p. 1197-1201, 1989

Superfund LDR Guide #6B, Obtaining a Soil and Debris Treatabilily Variance for Removal Actions, Superfund Publication 9347.3-068FS, USEPA, OSWER, September 1990

Guide for Conducting Treatability Studies Under CERCLA: Aerobic Biodegradation Remedy Screening - Interim Guidance, EPA/540/2-91/013A, USEPA, ORD, July 1991

Guide to Treatment for Hazardous Wastes at Superfund Sites, EPA/540/2-89/052, USEPA Office of Environmental Engineering and Technology Development, March 1989

Removal Program Representative Sampling Guidance, Volume 1: Soil, USEPA, OERR Publication 93 60.4-10, November, 1991

Removal Program Representative Sampling Guidance, Volume 4: Hazardous Waste - Interim Final OSWER Directive Document in Preparation by USEPA, OERR, June 1992

Innovative Treatment Technologies: Overview and Guide to Information Sources, EPA/540/9-91/002, USEPA OSWER, TIO, October 1991

APPENDIX A - U.S. Waste Exchanges

CALIFORNIA WASTE EXCHANGE
Robert McCormick
Department of Health Services
Toxic Substances Control Division
400 P Street
Sacramento, CA 95812
(916) 324-1807

INDIANA WASTE EXCHANGE
Environmental Quality Control
1220 Waterway Boulevard
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INDUSTRIAL MATERIAL EXCHANGE SERVICE
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INDUSTRIAL MATERIALS EXCHANGE
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Office of
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Washington, DC 20460

Directive: 9200.5-162
EPA/540/R-95/128
PB 95-963410

December 1995

Superfund

Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites

United States Environmental Protection Agency

Office of Solid Waste and Emergency Response

Directive: 9355.0-47FS
EPA 540-F-93-047
PB93-963345
September 1993

Presumptive Remedies: Policy and Procedures

Office of Emergency and Remedial Response
Hazardous Site Control Division 5203G

Quick Reference Fact Sheet

Since Superfund's inception in 1980, the remedial and removal programs have found that certain categories of sites have similar characteristics, such as types of contaminants present, types of disposal practices, or how environmental media are affected. Based on information acquired from evaluating and cleaning up these sites, Superfund is undertaking an initiative to develop presumptive remedies to accelerate future cleanups at these sites. The presumptive remedy approach is one tool of acceleration within the **Superfund Accelerated Cleanup Model (SACM).**

The objective of the presumptive remedies initiative is to use the program's past experience to streamline site investigations and speed up selection of cleanup actions. Overtime presumptive remedies are expected to ensure consistency in remedy selection and reduce the cost and time required to clean up similar types of sites. Presumptive remedies are expected to be used at all appropriate sites except under unusual site-specific circumstances. EPA plans to develop a series of directives on presumptive remedies for various types of sites.

This directive serves as an overall guide to the presumptive remedies initiative and its effect on site cleanup. Through a question and answer format, it explains, in general terms, ways in which presumptive remedies will streamline or change the remedial and removal processes from the conventional processes and how certain Superfund policies will be affected by the initiative. This directive also unites the series of directives, due to come out over the next year, on presumptive remedies for specific site types (e.g., Volatile Organic Compounds (VOCs), wood treaters, ground water). This general directive, together with the site type-specific directives, will provide readers with a comprehensive knowledge of the procedural as well as policy considerations of the presumptive remedies initiative. The directive is designed for use by staff involved in managing site cleanups (e.g,, Remedial Project Managers (RPMs), On-Scene Coordinators (OSCs), Site Assessment Managers (SAMs)). Site managers in other programs, such as RCRA Corrective Action, the Underground Storage Tank program, State Project Managers, or private sector parties, may also use this directive, as appropriate.

Provided below are several common questions and answers regarding general issues associated with presumptive remedies.

Q1. What Are Presumptive Remedies and How Should They Be Used?

A. Presumptive Remedies are preferred technologies for common categories of sites based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. EPA has evaluated technologies that have been consistently selected at past sites using the remedy selection criteria set out in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP); reviewed currently available performance data on the application of these technologies, and has determined that a particular remedy, or set of remedies, is **presumptively** the most appropriate for addressing specific types of sites.

Presumptive remedies are expected to be used at all appropriate sites The approaches described in each presumptive remedies directive are designed to accommodate a wide range of site-specific circumstances. In some cases, multiple technologies are included (e.g., VOCs); in others, various components of the presumptive remedy are optional, depending on site situation (e.g., municipal landfills). Further, these directives recognize that at some sites, there may be unusual circumstances (such as complex contaminant mixtures, soil conditions, or extraordinary State and community concerns) that may require the site manager to look beyond the presumptive remedies for additional (perhaps more innovative) technologies or remedial approaches.

These tools will help site managers to focus data collection efforts during site investigations (e.g., remedial investigations, removal site evaluation) and significantly reduce the technology evaluation phase (e.g., Engineering Evaluation/Cost Analysis (EE/CA) and/or Feasibility Studies (FS)) for certain categories of sites. The specific impacts on the various stages of the remedy selection process are highlighted in questions 7 and 8 of this guidance. It is advised that presumptive remedies be used with the assistance of the expert teams [1] or the various categories of sites.

Q2. Why Should Presumptive Remedies Be Used?

A. Presumptive remedies are expected to have several benefits. Limiting the number of technologies considered should promote focused data collection, resulting in streamlined site assessments and accelerated remedy selection decisions which achieve time and cost savings. Additional time savings could be realized during the remedial design since early knowledge of the remedy may allow technology-specific data to be collected upfront during the remedial investigation. Presumptive remedies will also produce the added benefit of promoting consistency in remedy selection, and improving the predictability of the remedy selection process for communities and potentially responsible parties (PRPs).

Presumptive remedies may be used as part of a wide variety of response actions. These actions include non-time-critical removal and early remedial actions, actions at sites with different leads (e.g., Fund-lead, State-lead, PRP-lead), actions addressing one or more contaminated media, actions with several operable units, and actions involving treatment trains.

Q3. Can Presumptive Remedies be Implemented Within the Existing NCP Process?

A. Yes. The presumptive remedy approach is consistent with all of the requirements of the NCP, and in particular the site management principle of streamlining (see section 300.430(a)(1)(ii)(C)). The presumptive remedy approach simply consolidates what have become the common, expected results of site-specific decision making at Superfund sites over the past decade. The various presumptive remedies directives and supporting documentation (e.g., "Feasibility Study Analysis for CERCLA Sites with Volatile Organic Compounds in Soils") provide the basis for an administrative record which justifies consideration of a very limited number of cleanup options. These materials summarize the findings of EPA's research and analysis, and the reasons that were found for generally considering certain technologies more or less appropriate.

The availability of presumptive remedies does not preclude a Region from expanding the FS (either on its own initiative or at the suggestion of outside parties) to consider other technologies under unusual site-specific circumstances. The site type directives will define the kind of circumstances (e.g., soil conditions, heterogeneous and complicated contamination mixtures, field tests demonstrating significant advantages of alternate or innovative technologies, etc.) that may make presumptive remedies less clearly suited for particular sites. Most of these directives also provide references to additional technologies if the presumptive remedies are found not to apply at a particular site.

Q4. How Did the Presumptive Remedies Initiative Evolve?

A. The general concept of presumptive remedies was first proposed in 1990 during the Superfund 90-Day Study and subsequently in 1991 during the 30-Day Study as a method of accelerating the remedial process. These management studies were efforts to generate options for accelerating the overall Superfund clean-up process. The presumptive remedies initiative is also consistent with, and supports, a larger program initiative known as the Superfund Accelerated Cleanup Model (SACM). SACM incorporates the experience gained from past Superfund actions into an integrated approach to site cleanup aimed at getting response action decisions made and implemented more quickly. The presumptive remedies initiative is one mechanism for accomplishing the broad streamlining goal set forth by SACM. The presumptive remedies initiative was also identified as one of the Administrative Improvements to Superfund in June of 1993.

Table 1
Current Presumptive Remedies and Contacts

Site Type/Schedule	Presumptive Remedy(ies)	Anticipated Products	EPA Contact
General Policy and Procedures (9/93)	NA	*Presumptive Remedies: Policy and Procedures*	Shahid Mahmud Headquarters, HSCD (703) 603-8789
Volatile Organic Compounds (VOCs) in Soils (9/93)	Soil Vapor Extraction, Thermal Desorption, Incineration	*Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with VOCs in soil*	Shahid Mahmud Headquarters, HSCD (703) 603-8789
Wood Treaters (6/94)	For Organics - Incineration, Bioremdiation, Dechlorination For Inorganics - Immobilization	*Presumptive Remedy: Wood Treating Sites* *Technology Selection Guide for Wood Treater Sites (5/93)*	Lisa Boynton Headquarlas, ERD (703) 603-9052 Harry Allen Emergency Response Division (908) 321-6747
Municipal Landfills (9/93)	Containment (could include capping, leachate collectionand treatment , LF gas treatment, institutional controls, etc.)	*Presumptive Remedy for CERCLA Municipal Landfill Sites*	Andrea McLoughlin Headquarters, HSCD (703) 603-8793
Contaminated Ground Water (1/94)	Pump and Treat (Will specify prefeerred treatment technologies & describe overall approach)	*TBD*	Ken Lovelace headquarters, HSCD (703) 603-8787
Region 7 Pilots - PCB Sites, Coal Gas Sites, Grain Storage Sites (6/94)	TBD	*TBD*	Diana Engeman Region 7 (913) 551-7746

KEY:
TBD - To Be Determined
NA - Not Applicable

Q5. What Other Presumptive Remedy Initiatives are Underway or Planned?

A. There are a variety of presumptive remedy activities currently planned or underway. Table 1 lists the site types with the anticipated schedule of associated presumptive remedy products that are currently underway along with the Headquarters and Regional contacts. There are four site types for which presumptive remedies are being developed in EPA Headquarters: VOCs, wood treaters, municipal landfills, and contaminated ground-water sites. Concurrently, Region 7 is preparing presumptive remedy guidances for PCB, coal gasification, and grain storage sites.

Table 2
Generic Effect of Presumptive Remedies

	Phases of Cleanup Process	Effect on Cleanup Process
SITE ASSESSMENT	PA/SI or Removal Site Evaluation	X
	Scoping • Collect and analyze existing data	O
	• Identify initial project/OUs and remedial action objectives	■
	• Identify range of likely alternatives	■
	• Identify potential ARARs	O
	• Identify initial COCs	O
	• Prepare project plans	■
	Remedial Investigation • Conduct field investigation	X(1)
	• Define nature and extent of contamination	O(1)
	• Identify ARARs	O
	• Conduct baseline risk assessment	O(1)
FEASIBILITY STUDY OR EE/CA	Remedy Selection • Identify potential treatment technologies and containment/disposal requirements	●
	• Screen technologies	●
	• Assemble technologies into alternatives	●
	• Screen alternatives as necessary to reduce number subject to detailed analysis	●
	• Further refine alternatives as necessary	■
	• Analyze alternatives against the nine criteria and each other	■
	Proposed Plan	■
	Record of Decision	■
	Remedial Design	■

O = not impacted ■ = Streamlined
X = Focused ● = Eliminated
(1) Streamlined for Municipal Landfills

Q6. How Will Presumptive Remedies Affect the Remedy

A. Presumptive remedies are anticipated to affect several phases of the current remedy selection process. A diagram depicting the generic impacts on the overall process is provided in **Table 2.**

Data collection during the initial site assessment (Preliminary Assessment/Site Inspection (PA/SI) or Removal Site Evaluation) can be used to help define the specific site type and to determine whether presumptive remedies may be potentially applicable.

Assuming the site warrants further attention (i.e., it is listed on the National Priorities List (NPL) or determined by the Regional Decision Team (RDT) to be an

NPL-caliber site or to merit a removal action), further confirmation of the site type should take place as either an RI/FS or EE/CA is scoped to determine whether the site is a potential candidate for presumptive remedies. For a detailed discussion of how to make this determination, refer to the appropriate site type-specific directive. If it is determined that a site falls into a certain category, the presumptive remedies associated with that site type should be included in the list of likely remedial alternatives (e.g., no action, presumptive remedies, etc.) for the site. Other aspects of scoping that may be affected by presumptive remedies are the designation of appropriate operable units (OUs) and identification of data needed to support the evaluation and selection of a presumptive remedy.

Presumptive remedies are expected to help focus data collection efforts. Specifically, initial data collection would focus on confirming the site type. If the site is of the type for which presumptive remedies have been developed, the streamlined steps for site characterization outlined in the site type-specific directive for the particular site type should be followed. These steps outline data collection to determine the extent of contamination and to support selection of the presumptive remedy and Remedial Design (RD).

Presumptive remedies will streamline the FS and the alternatives analysis in the EE/CA more than any other phase of the remedy selection process. In most cases, after a site is confirmed as being a type for which presumptive remedies exist, a focused FS or EE/CA which eliminates the technology identification and screening step would be prepared. The study would limit its consideration to the no action alternative and the presumptive remedy technologies. This is possible because EPA has conducted an analysis of potentially available technologies for most of the presumptive remedies site categories and has determined that certain technologies are routinely and appropriately screened out either on the basis of effectiveness, implementability, or excessive cost (NCP Section 300.430 (e)(3) and (7)), or have not been selected under the nine criteria analysis identified in NCP Section 300.430 (e) (9). This detailed analysis will serve to substitute for the development and screening of alternatives phases of the FS (and will allow the remaining alternatives to be limited to variations of the presumptive remedy). The site-specific directive and supporting documentation (e.g., "Feasibility Study Analysis for CERCLA Municipal Landfill Sites") along with this directive then can be placed in the administrative record for the site to support the elimination of the screening step identified in section 300.430 (e) (1) of the NCP. Further supporting materials can be provided by Headquarters (e.g., FS reports included in the analysis, technical reports), as needed. The specific presumptive remedy directives address the process of eliminating the alternatives development and screening step of the RI/FS or EE/CA in further detail. The directives also provide generic discussion of a partial nine criteria analysis (excluding state ARARs and community and state acceptance) and may help streamline the detailed analysis of alternatives within the FS and EE/CA reports. However, the user is cautioned that the criteria are discussed on a general basis and the nine criteria analysis should be supplemented to reflect the site-specific conditions.

The Proposed Plan (PP) and subsequent ROD would be similarly streamlined by focusing only on the presumptive remedy(ies). The remedial design (RD) may be streamlined since some RD data will likely have been collected previously during the site assessment and RI.

Q7. How Will Presumptive Remedies Affect the Removal Process?

A. Non-time critical removal actions are anticipated to be used more often to accomplish early actions at Superfund sites under SACM. The presumptive remedies approach will focus the data collection during the removal site evaluation and reduce the number of technologies identified and analyzed in the EE/CA. Presumptive remedies are not expected to have an impact on emergency and time-critical actions under the removal program.

Q8. What are the Implications of Presumptive Remedies for Innovative Technologies?

A. The NCP in section 300.430 (a) (1) (iii) (E) states that "EPA expects to consider using innovative technology when such technology offers the potential for comparable or superior treatment performance and implementability, fewer. or lesser adverse impacts than other available approaches, or lower costs for similar levels of performance than demonstrated technologies." The use of the presumptive remedies may tend to reduce the frequency of the full evaluation of innovative technologies. However, as indicated previously, the presumptive remedies provide a toot for streamlining the remedy selection process. They do not preclude the consideration of innovative technologies should the technologies be demonstrated to be as effective or superior to the presumptive remedies. Innovative technologies may be evaluated and recommended in addition to the presumptive remedies where these criteria are met.

EPA encourages review of the latest Innovative Technologies Semi-Annual Reports or Engineering Bulletins for the up-to-date information on the potential effectiveness and applicability of various innovative technologies. Site managers are strongly encouraged to involve the site-type expert team (see Question 13) to determine whether unusual circumstances exist to consider a non-presumptive remedy based on site-specific conditions and/or conununity, state, and PRP concerns, or the availability of a potentially promising innovative technology.

Q9. How Will Presumptive Remedies Affect Risk Assessments?

A. Generally, the role of baseline risk assessments under the presumptive remedy approach would be unaffected with Municipal Landfill sites being a notable exception. It is anticipated that risk assessments would still be needed on a site-specific basis to assist site managers in determining the need for a response action. EPA managers have indicated the value of the risk assessment in communicating with states, PRPs, and local communities about the nature and extent of health and environmental threats. Therefore, it is recommended that the current risk assessment process be continued on an individual site basis except for Municipal Landfills. The site manager should refer to the EPA Directive entitled "Presumptive Remedy for CERCLA Municipal Landfill Sites," Directive No. 9355.0-49FS to identify streamlining opportunities at Municipal Landfill sites.

Guidance on developing risk-based preliminary remediation goals (PRGs) would be unaffected under this initiative. These goals are needed for individual sites especially in the absence of ARARs to assist in determining which remedial options will result in medium-specific chemical concentrations that are protective of human health. For example, there may be several candidate presumptive remedies identified in the site-type directives. But it is the extent and degree of contamination across a given site that will determine whether a technology, which is predicted to reduce a chemical's concentration to some specified level, will be adequate by itself to produce protective concentrations following remedial action. For some sites or site locations, because of the magnitude of contamination or co-occurrence of contaminants, it may be necessary to assemble several technologies into a treatment train to adequately reduce levels of all chemicals of concern in a medium to protective levels. In other cases, it may be necessary to evaluate the use of institutional and/or engineering controls on an area following remediation to ensure protection during subsequent land use. In other words, it is not reasonable to assume that because a specific technology resulted in "protection" at one site, it will result in protective levels at all sites. A determination that the selected remedy will result in protection of human health and the environment must be made for each site. Both ARARs and risk-based PRGs are important tools in this exercise.

Generally, presumptive remedy directives will specify those technologies that have been determined to achieve levels protective of human health and the environment under a variety of site conditions. However, because all sites differ to some extent, especially in their relation to surrounding communities and sensitive ecosystems, a determination must still be made on a site-specific basis as to how a given remedy design is expected to achieve "protectiveness" during remedy construction and following remedial action. Overall protection of human health and the environment is one of two threshold considerations (the other being compliance with ARARs) that must be met in order for an alternative to be eligible for selection as the remedy for a given site.

Q10. What if Outside Parties such as PRPs or the Community Want Other Alternatives Considered?

A. The identification of a presumptive remedy does not relieve EPA of the obligation to propose the remedy for public comment, or to respond to comments suggesting that other alternatives should have been considered. In some cases, the information in the site-type directive and supporting documentation may be sufficient to address such comments; in others, additional analysis may be required to assess the relative merits of an alternative technology proposed by a commenter.

To reduce the risk of delay due to the need to respond to such comments, it is generally desirable to publicize the planned use of presumptive remedies early on, and give States, communities, PRPs, and others an early opportunity to express any concerns they may have about focusing the FS or EE/CA in this way. The agency may then decide whether to include additional alternatives in the FS or EE/CA so that those concerns can be addressed before the remedy is proposed.

In general, it is expected that the directive and supporting documents will provide substantial justification for preferring the presumptive remedy over alternative technologies. Therefore, the submission of comments advocating other approaches does not necessarily require broadening of the FS or EE/CA, or conducting additional analysis after the plan has been proposed. Whether additional documentation is required will depend upon how substantial or persuasive the comments are (e.g., whether a comment identifies unusual site circumstances that seriously call into question the applicability of the presumptive remedy). The Region will have to assess this by evaluating each comment on its own merits.

It should be noted that even if the FS is broadened to consider alternatives other than the presumptive remedy, much of the benefit of the presumptive remedy approach can still be achieved. In such cases, it is not necessary to address the full array of possible technologies, rather only the presumptive remedy and the specific alternative(s) that genuinely warrant detailed study. Therefore, the FS can still be narrowed and data gathering can still be focused.

Q11. How do State ARARs Affect the Use of Presumptive Remedies

A. Any remedy, including presumptive remedies, must be selected in accordance with Section 121 (d) (2)(A)(ii) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which specifies that selected remedial actions comply with promulgated standards under Federal and more stringent State environmental laws (i.e., State ARARs). At this time it is difficult to predict situations where presumptive remedies will not comply with State ARARs, and such issues must necessarily be addressed on a site-specific basis. However, as the presumptive remedies have been widely selected, they are likely to be capable of meeting State ARARs.

Q12. What Are the Implications of Presumptive Remedies on Community, PRP, and State Relations?

A. It will generally be desirable to notify the community, State, and PRP(s) as early in the clean-up process as possible that presumptive remedies are being considered for the site. This notification can take the form of a fact sheet, a notice in the newspaper, and/or a public meeting in which the site manager (with assistance from the expert team, as desired) explains the rationale for taking such actions and distributes the appropriate directives of the site type in question. Additionally, the site manager should explain the potential benefits associated with the use of presumptive remedies such as time and cost savings, and consistency. Early discussions about the rationale for presumptive remedies should help instill confidence in both the technologies and remedy selection processes.

Q13. Dow Will EPA Communicate Progress on Current Presumptive Remedies, Newly Developed Presumptive Remedies, and Future Issues Related to Presumptive Remedies?

A. Information about presumptive remedies will be communicated in several ways. First, it is anticipated that an orientation will be provided to communicate the key elements of presumptive remedies to Regional site managers as appropriate. This may be followed by periodic meetings with expert teams, if necessary, to scope out the applications of presumptive remedies on a site-specific basis. The expert team may also be used to convey any new developments on technology or policies and procedures for general or specific applications. A quarterly conference call is also anticipated between site managers and the expert teams to allow for the exchange of ideas and to identify and resolve technical issues. Technology selection directives, SACM Bulletins, and Q&A directives will be published periodically to disseminate information on presumptive remedies and related issues as they arise. Finally, the presumptive remedies directives on the various site categories will be updated every several years to reflect new technology development and up-to-date performance data, as appropriate.

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[1] It is envisioned that for most categories of sites, teams of experts (technical, legal, policy, etc.) who have developed the presumptive remedies guidance and Regional site managers conducting field demonstrations, will be available to assist site managers in implementing presumptive remedies on a site-specific basis.

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United States
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Emergency Response

RCRA, Superfund & EPCRA Hotline Training Module

Introduction to:

Superfund Accelerated Cleanup Model

Updated February 1998

EPA540-R-98-025
United States Environmental Protection Agency
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SUPERFUND ACCELERATED CLEANUP MODEL

CONTENTS

1. INTRODUCTION

The Superfund program has been both praised and criticized for how it addresses abandoned hazardous waste sites. One of the most effective parts of the program is the CERCLA statutory enforcement provisions that force polluters to pay. On the other hand, one of the major criticisms has been that site assessments, response actions, and enforcement have been costly and slow. In 1980, when CERCLA was enacted, Congress did not anticipate the number of uncontrolled hazardous waste sites that actually exist. With reauthorization in 1986, Congress amended CERCLA enhancing the response process, enforcement provisions, public participation provisions, and increasing the appropriations to 8.5 billion dollars to meet the needs of the program. Several factors that drove costs up at Superfund sites include extended site assessments with duplicative sampling efforts, litigation with potentially responsible parties (PRPs), and lengthy remedy selection analyses. These factors, as well as others, contribute to the public's perception that the Superfund program was inefficient. In April 1992, EPA responded to these shortcomings by introducing the Superfund Accelerated Cleanup Model (SACM). SACM streamlines the traditional Superfund response process that was established by Congress in CERCLA, as amended by SARA. SACM does not change the regulations for the traditional site evaluation process, but rather makes administrative changes to the traditional approach, while remaining consistent with existing response regulations outlined in the National Contingency Plan (NCP).

The main goals of SACM are:

- Non-duplicative site assessment
- Prompt risk reduction
- Cross-program coordination of response planning
- Early initiation of enforcement activities
- Early public notification and participation.

After successfully implementing the SACM process at several pilot sites, EPA announced its expectations to use SACM at all Superfund sites (OSWER Directive 9203.1-13).

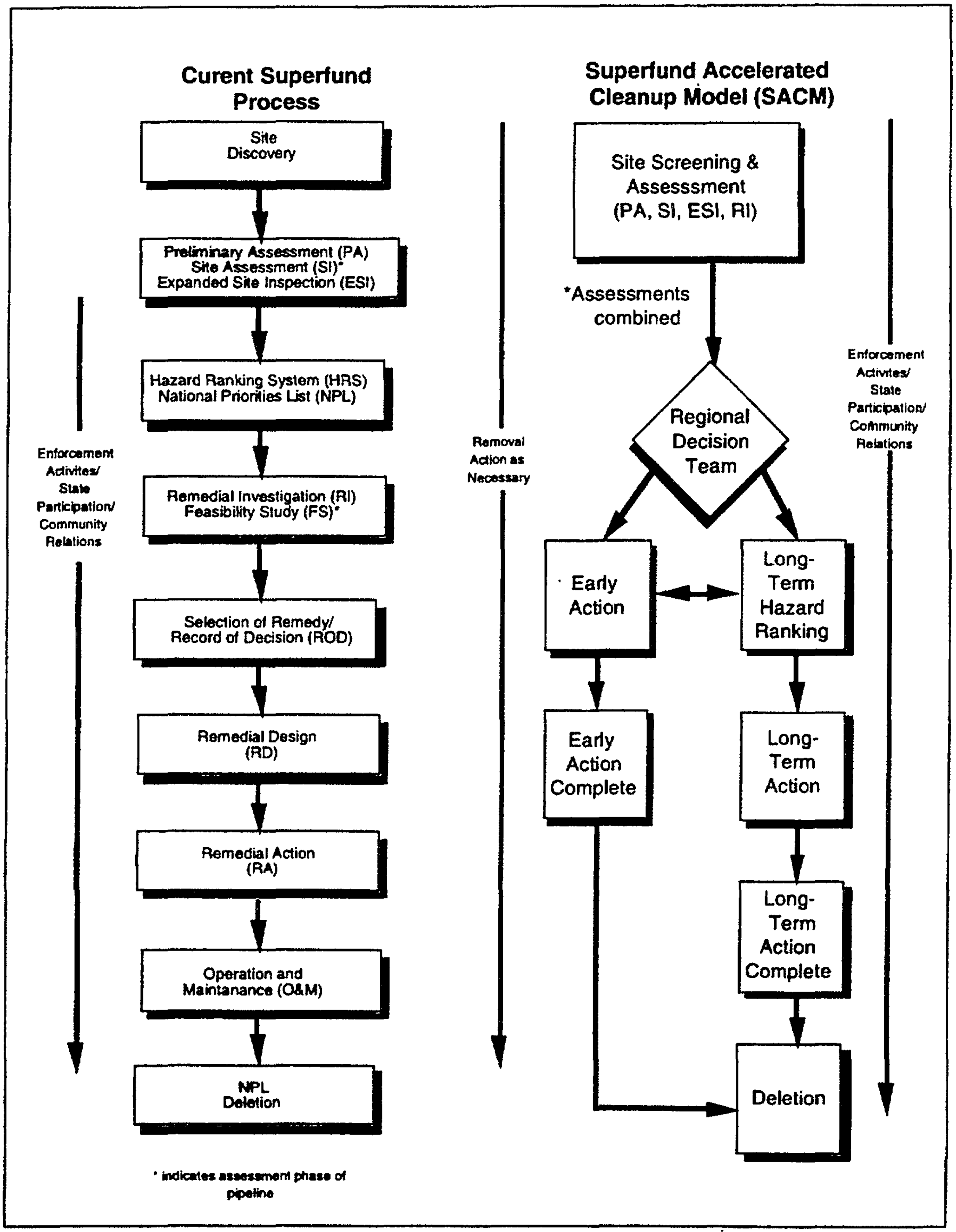
In addition to SACM, EPA is developing other tools, such as presumptive remedies and response strategies, to speed up the response process. Presumptive remedies are used for sites with similar conditions and contamination. These presumptive remedies are technologies that have been selected repeatedly at a preponderance of certain types of Superfund sites. For instance, certain technologies have been consistently selected during the past decade for wood preserving facilities; therefore, instead of following a lengthy remedy selection process for each site, the lead agency may decide to examine just a few of the pre-designated presumptive remedies for wood preserving facilities. Presumptive response strategies are more comprehensive than presumptive remedies in that they address all components of the response process, rather than just the remedy selection.

This module presents the primary aspects of SACM compared to the traditional Superfund response process. These two approaches to the Superfund response process are illustrated in Figure 1. In addition, this module discusses presumptive remedies by covering what they are, and providing an overview of the guidance EPA has developed.

After you have completed this module, you should be able to:

- Explain how SACM streamlines the traditional response process
- Be familiar with the terms of the response process as renamed by SACM
- Explain what presumptive remedies are and provide examples.

Use this list of objectives to check your knowledge after the training session on SACM and presumptive remedies.


Curent Superfund Process
Site Discovery
Preliminary Assessment (PA)
Site Assessment (SI)*
Expanded Site Inspection (ESI)
Hazard Ranking System (HRS)
National Priorities List (NPL)
Remedial Investigation (RI)
Feasibility Study (FS)*
Selection of Remedy/
Record of Decision (ROD)
Remedial Design (RD)
Remedial Action (RA)
Operation and Maintanance (O&M)
NPL Deletion
Enforcement Activites/ State Participation/ Community Relations
Removal Action as Necessary
* indicates assessment phase of pipeline
Superfund Accelerated Cleanup Model (SACM)
Site Screening & Assesssment (PA, SI, ESI, RI)
*Assessments combined
Regional Decision Team
Early Action
Long-Term Hazard Ranking
Early Action Complete
Long-Term Action
Long-Term Action Complete
Deletion
Enforcement Activites/ State Participation/ Community Relations

2. ELEMENTS OF SACM

To streamline the traditional Superfund approach, SACM reorganizes and restructures various components of the response process. In particular, SACM integrates the numerous Superfund site assessments to create a single, more efficient evaluation. SACM also redefines the traditional removal and remedial actions as early actions and long-term actions, thereby achieving quicker risk reduction and a more effective, final site cleanup. EPA also continues to highlight rapid enforcement actions and a high level of public participation as an integral part of SACM. To oversee effective implementation of its new approach, SACM uses the expertise of Regional Decision Teams (RDTs). This section further describes these key aspects of SACM.

2.1 SITE ASSESSMENT

Prior to SACM Superfund site evaluations followed a series of discrete, redundant steps. EPA often performed evaluations under the removal program (preliminary assessments (PAs), and site inspections (SIs)), and the remedial program (PAs, SIs, Hazard Ranking System scores (HRS), remedial investigations (RIs)) separately, without considering information gathered under preceding evaluations. Thus, each evaluation potentially required separate contracts, equipment, sampling teams, sampling strategies, and health and safety plans. This resulted in inefficient use of time and money that reflected negatively on the program in the eyes of both Congress and the public.

SACM accelerates the response process by integrating evaluations using both removal and remedial authority. Before beginning an assessment, EPA predicts the data needs based on the expected response. For example, if EPA believes the contamination is extensive enough to warrant a site's inclusion on the NPL, data can be collected simultaneously for the HRS (to determine if the site will be placed on the NPL) and for the RI/FS (to select an appropriate remedy). If possible, one continuous site evaluation with one report is conducted at each site (OSWER Directive 9203.1-03). For more guidance on site assessment and the SACM process, refer to Assessing Sites Under SACM — Interim Guidance (OSWER Directive 9203.1-051).

The following fictional examples provide an illustration of the traditional site assessment versus the SACM integrated assessment.

Example 1a: Traditional Superfund Site Assessment:

EPA receives a public request to assess an old chemical manufacturing facility containing thousands of leaking barrels in an unlined lagoon. A contractor performs a removal PA and the site is placed in CERCLIS. The contractor then conducts a removal SI to determine the need for a removal. The SI confirms that the soil and water are extremely contaminated, and EPA removes the barrels to minimize immediate threats. A year after completion of the removal, EPA initiates the remedial SI and begins to collect data for the HRS. The site is placed on the NPL and the RI/FS begins. Three years later, after completion of the RI/FS, remedy selection, and remedial design, EPA initiates the remedy. Five years have elapsed from discovery of the site to implementation of the remedy.

Example 1b: SACM Integrated Site Assessment:
EPA receives a public request to assess the same chemical manufacturing facility. After initial data gathering, the Agency believes the contamination will warrant the site's inclusion on the NPL. A contractor collects data to determine whether a removal action is necessary, to calculate the HRS score, and to select a remedy. The CERCLA and NCP requirements for the removal and remedial PA and SI, the HRS ranking, and the RI/FS are all met in a single site evaluation with a single report. The barrels are removed, the site is placed on the NPL, and the remedial action begins. Two and a half years have elapsed from the site's discovery to implementation of the remedy.

The integration of the various site evaluations under the two programs, and the anticipation of the site's NPL listing, reduced the cost and duration of the response by two and a half years.

2.2 EARLY AND LONG-TERM ACTIONS

Since CERCLA created only two response authorities, remedial and removal, two separate cleanup programs evolved. Because all Superfund cleanup actions are required to use one of these authorities, EPA placed all sites into one of the two programs and the programs operated separately. SACM, instead of directing sites under one of the removal or remedial programs, uses both authorities together to conduct early and long-term actions.

EARLY ACTIONS

The duration of an early action should generally be less than five years. The goal of an early action is to quickly reduce threats to human health and the environment. This may require that more than one early action be taken at some sites. An early action operates under either removal or remedial authority. Emergency removals, time-critical responses, and non-time-critical responses are early actions taken under removal authority. Early remedial actions are performed under remedial authority. Depending on the type of action, different statutory and regulatory requirements must be met for Fund-lead sites. For instance, except in special circumstances, removal authority can only be used for actions requiring less than 2 million dollars and 12 months. State assurances, a record of decision (ROD), and identification of applicable or relevant and appropriate requirements (ARARs) are required for early remedial actions, just as they are for traditional remedial actions. An early action can occur in conjunction with a long-term action at a site. This is referred to as a "phased approach" and ensures a site is cleaned up as quickly and effectively as possible. Examples of early actions are given in Figure 2.

LONG-TERM ACTIONS

EPA expects long-term actions to take longer than five years to complete. They may occur at sites where high remedy implementation costs exist, or when long-term operation and maintenance activities (e.g., groundwater monitoring) are necessary. Long-term actions follow the NCP remedial process requirements, including NPL listing, a RI/FS, and a ROD. Examples of long-term actions are given in Figure 2. For more information on both early and long-term actions see Early Action and Long-term Action Under SACM -- Interim Guidance (OSWER Directive 9203.1-051).

Figure 2
TYPES OF EARLY AND LONG-TERM ACTIONS

Early Action	Either	Long-Term Action
Access Restrictions Source Removals Source Containment Source Structures	Source Remediation Capping/Containment Relocation Source Extraction Alternative Water Supply Property Acquisition Groundwater Plume Cleanup Plume Containment	Extensive Source Remediation Groundwater Restoration Surface Water Restoration

The following fictional examples illustrate how early actions and long-term actions require less time and resources than traditional removal and remedial actions.

Example 2a: Traditional Response Process:

A work crew discovers a small (e.g., three-acre) abandoned landfill while constructing an apartment complex in a residential area where the community relies on groundwater as its primary source of drinking water. A removal PA/SI determines that, to reduce immediate threats, the contaminated soil must be excavated and removed. Further, to prevent contaminated groundwater from reaching nearby drinking water aquifers, the removal contractor installs three extraction wells. Later in the remedial SI, EPA personnel decide to collect data for an HRS score, as well as for the RI/FS to select a long-term remedy. As part of this remedy, a second contractor excavates an additional, deeper layer of soil to eliminate the source of contamination. During the RI, EPA determines that the extraction wells installed under the removal program did not meet all ARARs, and were not situated to extract the entire plume of contaminated groundwater. The remedial contractor therefore installs four more wells, for a total of seven.

The contaminated groundwater plume is extracted and treated and the aquifer is returned to its beneficial use.

Example 2b: SACM Process:

At the same site, an integrated site assessment provides HRS and RI/FS data, and helps EPA determine that it must remove the surface layer of contaminated soil under time-critical authority, and a deeper layer of contaminated soil with an early remedial action. One contractor simultaneously removes both of these layers. Also, as a removal action, the contractor drills three extraction wells to protect the drinking water sources. The wells meet all ARARs and are strategically placed such that only one more well is needed for the long-term remedial action. These four wells extract the contaminated groundwater plume, and the aquifer returns to its beneficial use.

In this scenario, EPA used removal and remedial authorities together to consolidate steps in the cleanup process and provide an equal measure of protection and remediation. A more efficient remedial design saved time and money.

2.3 ENFORCEMENT

SACM continues to emphasize EPA's "enforcement first" policy. Thus, EPA must initiate potentially responsible party (PRP) searches and negotiations as early as possible. However, because response actions under SACM may begin sooner, there is a greater need to expedite PRP searches so that response actions may begin. To preserve valuable resources, Regions must be careful to expedite PRP searches only at sites that may need a remedial response. Thus, the timing of searches is very important, and EPA must have a clear strategy to conduct PRP searches.

In order to conduct PRP searches more quickly, SACM encourages the use of a phased PRP search that focuses on establishing the liability of, and negotiating with, those PRPs who are easily found. Once EPA identifies the core group of PRPs, the PRPs can lead the response, with EPA oversight. Involvement with PRPs whose liability is too costly or time-consuming (e.g., extensive litigation is necessary) to establish may be delayed until after initiation of the response action.

2.4 PUBLIC PARTICIPATION

EPA's experience has shown that early and frequent communication with local communities can enhance a site response; this is particularly true under SACM. Because SACM is a new and unfamiliar approach to cleanup, public outreach and education are crucial to obtaining public support. EPA must continue to involve the public as early as possible throughout all stages of the response process. Integrated site assessments and early actions, however, may have community involvement requirements that differ from traditional requirements. For example, because the NCP requires that the administrative record be made available when the RI/FS begins, a site undergoing a combined SI/RI/FS will require earlier establishment of an administrative record.

2.5 REGIONAL DECISION TEAMS

If SACM is to successfully decrease the time and money spent under the Superfund program, a creative and informed approach is needed for each site. To ensure solid decisions are made, an experienced and knowledgeable team of experts, typically called a Regional Decision Team (RDT), has been formed in many of the Regions. The goals of the RDT are effective coordination, communication, and integration of program authority, expertise, and resources to implement wise and consistent decisions at Superfund sites.

Regions have flexibility both in establishing and selecting the members of the RDT. Some Regions may have more than one team while some may not establish a RDT as a method to implement SACM. Members may include state officials, on-scene-coordinators (OSCs), remedial project managers (RPMs), community involvement coordinators, and site and risk assessors. Once selected, the RDT develops rules that apply to all sites in the Region including criteria for selecting response actions and PRP search methods. Strategies for communicating with Headquarters, states, and support agencies, such as the Department of Justice, are created, and a plan for integrating site evaluations is formed.

Although the day-to-day operations of each site remain the responsibility of the site managers, the RDT can play a major role in site-specific decisions. The Team prioritizes sites in the Region by addressing the worst sites first, and decides how early and long-term actions should be used at each site. The RDT may provide policy and strategic direction to site managers, sign RODs or action memoranda, and determine which sites are of NPL caliber so the RI/FS can be included in the integrated site assessment. In addition, the RDT ensures that response actions are fully consistent with the requirements contained in CERCLA and the NCP. For more information on SACM's RDT mechanism see <u>SACM Regional Decision Teams -- Interim Guidance</u> (OSWER Directive 9203.1-051)

3. PRESUMPTIVE REMEDIES AND RESPONSE STRATEGIES

Presumptive remedies are a key component of SACM. They represent a way to streamline remedy selection based on experience at certain types of sites. Before SACM, EPA presumed that each site on the NPL was unique and required a site-specific review of remedial alternatives. EPA has now learned from experience that many sites have similar contaminated media, types of wastes, or historical industrial practices, and as a result, will most likely require use of similar technologies in the remedy. By adopting technologies consistently selected at the majority of similar sites, presumptive remedies ensure that a site is cleaned up faster, while still remaining consistent with the NCP's intent of protecting human health and the environment. Also, since the Agency anticipates using presumptive remedies at appropriate sites, remedy selection is expected to be generally more consistent across the nation.

EPA identified several categories of sites where presumptive remedies are appropriate: municipal solid waste landfills (MSWLFs); sites with volatile organic compounds (VOCs) in soils, sediments, and sludges; and woodtreater sites. Presumptive remedy guidance exists for all of these types of sites and is under development for sites with metal contamination.

For certain types of sites or contaminants, EPA believes a broader approach, a "comprehensive response strategy," is more appropriate. To date, only a presumptive *response* strategy for sites with groundwater has been developed. EPA is currently contemplating a comprehensive response strategy for manufactured gas plant (MGP) sites. The discussion below provides details of existing and future presumptive remedies.

MUNICIPAL SOLID WASTE LANDFILLS

In September 1993, EPA selected a presumptive remedy for MSWLFs, which constitute approximately 20 percent of all NPL sites (OSWER Directive 9355.3-18FS). Because treatment is usually impracticable at such sites, the presumptive remedy is a containment remedy which includes the following components as appropriate on a site-specific basis: capping to contain the contamination, collection and treatment of the gas and leachate, containment of the contaminated groundwater plume, and the use of institutional controls to supplement engineering controls. Since all of these actions are demonstrated methods of reducing the risk at MSWLFs, they are now a part of a multi-component presumptive remedy for MSWLFs.

The containment presumptive remedy also takes into account the possibility that hot spots, e.g., drums containing principal threat wastes, may need to be addressed. EPA decides whether the combination of the waste's physical and chemical characteristics and volume is such that the integrity of the new containment system will be threatened if the waste is left in place. If so, the hot spot may need to be treated or excavated prior to construction of the landfill cap. This presumptive remedy does not address exposure pathways outside the landfill, and does not provide a long-term remedy for groundwater restoration. More guidance on the presumptive remedy for municipal waste landfills is found in Presumptive Remedy for CERCLA Municipal Waste Landfill Sites (OSWER Directive 9355.0-49FS).

SITES WITH VOCs IN SOILS

Over the years, EPA conducted numerous remedial actions at sites with VOC contamination. This wealth of experience allowed EPA in September 1993, to identify three preferred technologies based on a comprehensive ROD analysis. These treatment methods - soil vapor extraction, thermal desorption, and incineration of the contaminated soil - comprise the presumptive remedy for sites with VOC contamination. The first remedy, soil vapor extraction, removes VOCs by passing air through the soil. Thermal desorption heats the soil until the VOCs are vaporized and collected for treatment. Incineration decomposes VOCs at high temperatures. Except under unusual circumstances, one of these remedies should be used at a site with VOC contamination. More information on this presumptive remedy is found in Presumptive Remedies: Site Characterization and Technology Selection for CERGLA Sites with Volatile Organic Compounds in Soils (OSWER Directive 9355.0-48FS).

WOOD TREATER SITES

As EPA gained experience at sites contaminated by wood treatment processes, four treatment technologies emerged as the most frequently selected. The Agency selected these technologies as the presumptive remedies for wood treater sites in December 1995. Three of the technologies are for treatment of organic contaminants, and one is for treatment of inorganic contaminants. If organic contaminants are present at the site, bioremediation, which is the chemical degradation of organic contaminants using microorganisms, is the primary remedy. Thermal desorption or incineration are also options for treatment of organic contaminants. The presumptive remedy for wood treater sites with inorganic contamination is immobilization. Immobilization traps the chemical in place, either by solidifying it (e.g., with a cement), or stabilizing it (i.e., chemically binding it to its surroundings). Sites with both organic and inorganic contamination use a series of organic and inorganic treatments called a treatment train. For more guidance on wood treater sites, see Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites (OSWER Directive 9200.5-162).

GROUNDWATER CONTAMINATION

Initially, EPA did not anticipate the extent and types of groundwater contamination, nor the complexity of subsurface conditions found at Superfund sites. Since approximately 85 percent of Superfund sites have contaminated groundwater, EPA decided it necessary to create a remedy selection guidance. Because of the complexity of these sites, there is no single technology that is appropriate for all sites with groundwater contamination. Therefore, in October 1996, EPA created a presumptive *response strategy* instead of a presumptive *remedy*. Because it is difficult and time-consuming to fully characterize the subsurface nature of a site, a recurring problem at groundwater contaminated sites was that remedies were selected without sufficient data. Thus, a major part of the presumptive strategy is the phased approach, which allows data collected from initial assessment phases to be used to further characterize the site. Thus, the remedy is selected using more accurate and complete information. EPA also outlined methods for deferring the selection of, or refining, a remedy after the ROD is signed. Finally, the Agency selected several presumptive technologies for treatment of extracted groundwater. See Presumptive Response Strategy and Ex-Situ Treatment Technologies For Contaminated Ground Water at CERCLA Sites (OSWER Directive 9283.1-12) for more guidance.

FUTURE PRESUMPTIVE REMEDIES AND RESPONSE STRATEGIES

Only the metals in soils presumptive remedy remains to be completed. EPA considered developing additional presumptive remedies, including one for sites with PCB contamination, but found remedies for those other categories of sites already stipulated through other program regulations; thus no new presumptive remedies are currently anticipated. The current focus for this initiative is on appropriately using existing presumptive remedies. EPA's Technology Innovation Office is currently developing a presumptive response strategy for manufactured gas plant sites.

4. MODULE SUMMARY

EPA created SACM to reduce the time and money spent at Superfund sites, while continuing to protect human health and the environment. Instead of conducting a series of separate site assessments, SACM integrates them into one continuous site. assessment with one report, if possible. Also, where EPA once categorized all actions as either remedial or removal, the Agency now conducts early and long-term actions using either authority. This allows for earlier remedial actions and earlier risk reduction. EPA continues to use an enforcement first policy, and attempts to begin enforcement procedures as soon as possible under SACM. Public perception of SACM is a high priority, thus the involvement of the public at all stages of the response is absolutely necessary.

The SACM process is coordinated by RDTs comprised of EPA and state personnel experienced in early and long-term actions, site assessment, enforcement, and community relations.

The presumptive remedy initiative under SACM promotes the use of cleanup technologies historically shown to be effective at similar types of sites. To date, EPA has published presumptive remedies for municipal landfills, sites with VOC contamination, and wood treater sites, as well as-a presumptive response strategy for groundwater contamination.

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EPA

The Role of Cost in the Superfund Remedy Selection Process

Office of Emergency and Remedial Response | Quick Reference Fact Sheet

This fact sheet describes the role of cost in the selection of remedial actions under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly referred to as Superfund). Cost is a central factor in all Superfund remedy selection decisions. The objective of this fact sheet is to clarify the current role of cost as established in existing law, regulation, and policy. This fact sheet does not elevate or establish a new role for cost in the Superfund program, but rather describes the current role of cost as established by the Superfund statute (CERCLA) and the Superfund regulations (the National Oil and Hazardous Substances Contingency Plan (NCP)), and as expanded upon in EPA guidance.

Through the distribution of this fact sheet, EPA hopes to ensure that all stakeholders involved in the Superfund process fully understand the important role that cost plays in remedy selection under existing law and policy, and to summarize recent initiatives aimed at enhancing the cost-effectiveness of remedial actions. These initiatives include the National Remedy Review Board, Remedy Selection Rules of Thumb, and Updating Remedy Decisions.

Ø STATUTORY AND REGULATORY CONTEXT FOR THE CONSIDERATION OF COST

Understanding the role of cost in the Superfund remedy selection process requires an understanding of the statutory and regulatory provisions that guide this process. CERCLA established five principal requirements for the selection of remedies. Remedies must:

1) Protect human health and the environment;

2) Comply with applicable or relevant and appropriate requirements (ARARs) unless a waiver is justified;

3) Be cost-effective;

4) Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and

5) Satisfy a preference for treatment as a principal element, or provide an explanation in the Record of Decision (ROD) why the preference was not met.

The NCP sets forth the Remedial Investigation/Feasibility Study (RI/FS) process for gathering the information necessary to select a remedy that is appropriate for the site and fulfills these statutory mandates. The RI includes sampling and analysis to characterize the nature and extent of site contamination, performance of a baseline risk assessment to assess the current and potential future risks to human health and the environment posed by that contamination, and the conduct of treatability studies to evaluate the potential costs and effectiveness of treatment or recovery technologies in reducing the toxicity, mobility, or volume of specific site waste. The FS includes the development and screening of alternative remedial actions, and the detailed evaluation and comparison of the final candidate cleanup options. Typically, a range of options is developed during the FS concurrently with the RI site characterization, with the results of each influencing the other in an iterative fashion.

The NCP also lays out a two-step selection process, in which a preferred remedial action is presented to the public for comment in a Proposed Plan, Which summarizes preliminary conclusions as to why that option appears most favorable based on the information available and considered during the FS. Following the receipt and evaluation of public comments on the Proposed Plan, which may include new information (e.g., a fuller view of community input on the options, new information on technology performance), the decision maker makes a final decision and documents the selected remedy in a ROD. For a general discussion of this process, see EPA's *"Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA Interim Final," OSWER Directive 9355.3-01, October 1988,* and *"Guide to Selecting Superfund Remedial Actions,"* OSWER Directive 9355.0-27FS, hereinafter referred to as the RI/FS Guidance and the Remedy Selection Guidance, respectively.

In addition to the items discussed in more detail below, it is important to keep in mind that remedial action costs are influenced, in general, by the quality of the conceptual site model (CSM), which is a three-dimensional "picture" of site conditions that illustrates contaminant distributions, release mechanisms, exposure pathways, migration routes, and potential receptors. The CSM documents current site conditions and is supported by maps, cross sections, and site diagrams that illustrate what is known about human and environmental exposure through contaminant release and migration to potential receptors. It is initially developed during the scoping phase of the RI/FS, and modified as additional information becomes available. Careful evaluation of site risks, incorporating reasonable assumptions about exposure scenarios and expected future land use, and the definition of principal threat waste generally warranting treatment, help to prevent implementation of costly remediation programs that may not be warranted.

In addition, EPA expects that the appropriately consistent application of existing national policy and guidance will result in the selection of cost-effective remedies. Guidance that promotes cost-effective decision making includes the Presumptive Remedy series, Soil Screening Guidance, and Land Use Guidance. For more information, see OSWER Directives 9355.0-47FS, 9355.4-14FSA, and 9355.7-04, respectively.

Ù CONSIDERATION OF COST DURING THE DEVELOPMENT AND SCREENING OF ALTERNATIVES

During the first step of the FS, a range of remedial alternatives is developed and then screened in order to identify those alternatives that should be considered in more detail. Cost estimates developed for each option comprise the short- and long-term cost of remediation, including capital costs (e.g., the costs to put remedial technology in place, including those for equipment, labor, materials, and services), and the annual costs of operations and maintenance (O & M) for the entire period during which such activities will be required. Costs should be discounted to a common base year to evaluate expenditures over time. A discount rate of seven percent before taxes and after inflation should be used to account for the time value of money (see *"Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis," OSWER Directive 9355.3-20, June 25, 1993*). A more complete description of remedial action cost estimating can be found in the RI/FS Guidance.

Development of Alternatives

In elaborating the RI/FS process, the NCP instructs decision makers on how to implement both the mandate to utilize permanent solutions and treatment to the maximum extent practicable and the requirement to select remedial actions that are cost-effective. Specifically, the NCP establishes the program goal and expectations found at 40 CFR 300.430(a)(1)(iii) (See Exhibit 1). These expectations identify the appropriate methods of protection which generally should guide the development of cleanup options for common types of site situations, while allowing flexibility to modify these expectations to take into account truly unique site circumstances.

The NCP states that the overall goal of the remedy selection process is "to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste" *(40 CFR 300.430(a)(1)(i))*. This goal reflects CERCLA's emphasis on treatment as the preferred method of protection. However, recognizing that CERCLA tempers its emphasis on permanent solutions and treatment through the addition of the qualifier "to the maximum extent practicable," and also contains the co-equal mandate for remedies to be cost-effective, the NCP goes on to state that, in general, "EPA expects to use treatment to address the principal threats posed by a site, wherever practicable. Principal threats for which treatment is most likely to be appropriate include liquids, areas contaminated with high concentrations of toxic compounds, and highly mobile materials" *(40 CFR 300.430(a)(1)(iii)(A))(see "A Guide to Principal Threat and Low Level Threat Wastes," Publication 9380.3-06FS, November 1991)*.

At the same time, "EPA expects to use engineering controls, such as containment, for waste that poses a relatively low long-term threat or where treatment is impracticable," and to combine these

Exhibit 1

PROGRAM EXPECTATIONS

Protection of human health and the environment can be achieved through a variety of methods: treatment to destroy or reduce the inherent hazards posed by hazardous substances, engineering controls (such as contaminant), and institutional controls to prevent exposure to hazardous substances. The NCP sets out the types of remedies that are expected to result from the remedy selection process (Sec. 300.430(a)(1)(iii)).

' ***Treat principal threats, wherever practicable.*** Principal threats for which treatment is most likely to be appropriate are characterized as:

! Areas contaminated with high concentrations of toxic compounds;
! Liquids and other highly mobile materials;
! Contaminated media (e.g., contaminated ground water, sediment , soil) that pose significant risk of exposure; or
! Media containing contaminated concentrations several orders of magnitude above health-based levels.

' ***Appropriate remedies often will combine treatment and contaminant.*** For a specific site, treatment f the principal threats(s) may be combined with contaminant of treatment residuals and low-level contaminated material.

' ***Contaminant will be considered for wastes that pose a relatively low long-term threat or where treatment is impracticable.*** These include wastes that are near health-based levels, are substantially immobile, or otherwise can be reliably contained over long periods of time; wastes that are technically difficult to treat or for which treatment is infeasible or unavailable; situations where treatment-based remedies would result in greater overall risk to human health or the environment during implementation due to potential explosiveness, volatilization, or other materials handling problems; or sites that are extraordinarily large where the scope of the problem may make treatment of all wastes impracticable, such as municipal landfills or mining sites.

' ***Institutional controls are most useful asa supplement to engineering controls for short- and long-term management.*** Institutional controls (e.g.; deed restrictions, prohibitions of well construction) are important in controlling exposure during remedial action implementation and as supplement to long-term engineering controls. Institutional controls alone should not substitute for more active measures (treatment or contaminant) unless such active measures are found to be impracticable.

' ***Innovative technologies should be considered if they offer the potential for comparable or superior treatment performance, fewer/lesser adverse impacts, or lower costs for similar levels of performance than demonstrated technologies.***

' ***Ground waters will be returned to their beneficial uses wherever practicable within a timeframe that is reasonable given the particular circumstances of the site.***

methods and use of institutional controls, as appropriate, at sites with both types of contaminated materials *(40 CFR 300.430(a)(1)(iii)(B) and (C))*

In addition, “EPA expects to use institutional controls such as water use and deed restrictions to supplement engineering controls as appropriate for short- and long-term management to prevent or limit exposure to hazardous substances, pollutants, or contaminants. . .. The use of institutional controls shall not substitute for active response measures (e.g., treatment and/or containment of source material, restoration of ground waters to their beneficial uses) as the sole remedy unless such active measures are determined not to be practicable, based on the balancing of trade-offs among alternatives that is conducted during the selection of remedy” *(40 CFR 300.430(a)(l)(iii)(D))*

The NCP also contains the following expectation for Ground Water Response Actions: “EPA expects to return usable ground waters to their beneficial uses whenever practicable, within a time frame that is reasonable given the particular circumstances of the site. When restoration of ground water to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction" *(40 CFR 300.430(a)(1)(iii)(F))*. This recognizes that there may be particular site circumstances (e.g., DNAPL in fractured bedrock) where complete restoration will not be practicable.

These Superfund program expectations guide the development of remedial alternatives during the FS. Although cost is not a specific element of the Superfund program expectations, the recognition that different waste management approaches (i.e., combinations of treatment, containment, and institutional controls) may be appropriate at different sites depending on the types of threats posed, reflects a "built-in" sensitivity to the issue of cost in the Superfund remedy selection process (e.g., large sums of money should not be spent treating low-level threat wastes). These expectations reflect EPA's belief that certain source materials are generally addressed best through treatment because of technical uncertainties regarding the long-term reliability of containment of these materials, and/or the serious consequences of exposure should a release occur. These expectations also reflect the conclusion that other source materials generally can be reliably contained.

Screening of Alternatives

The NCP describes cost as one of three "screening" criteria (the others being effectiveness and implementability) used to identify higher cost alternatives that should not be carried forward for detailed evaluation. Alternatives may be screened out if they:

1. Provide "effectiveness and implementability similar to that of another alternative by employing a similar method of treatment or engineering control, but at greater cost" *(40 CFR 300.430(e)(7)(iii))*.

2. Have costs that are "grossly excessive compared to [their] overall effectiveness" *(40 CFR 300.430(e)(7)(iii))*. For example, the costs associated with treating a complex mixture of heterogeneous wastes without discrete hot spots (e.g., a large municipal landfill) would likely be considered excessive in comparison to the effectiveness of such treatment. As a result, a treatment alternative for such a site would likely be eliminated from consideration during the screening process.

Cost estimates at the alternative screening stage should focus on relative, rather than absolute, accuracy. At the screening stage, it may also be unnecessary to evaluate costs that are common to all alternatives.

î CONSIDERATION OF COST DURING THE DETAILED ANALYSIS OF ALTERNATIVES AND THE IDENTIFICATION OF A PREFERRED ALTERNATIVE

The purpose of the detailed analysis is to objectively assess the alternatives with respect to nine evaluation criteria that implement the statutory provisions of CERCLA section 121. This analysis consists of an individual evaluation of each alternative with respect to each criterion, and a comparison of options designed to determine the relative performance of the alternatives and identify major trade-offs among them (i.e., relative advantages and disadvantages) with respect to the same factors.

The decision maker uses information assembled and evaluated during the detailed analysis in selecting a remedial action. Cost estimates at the detailed analysis stage should capture all remedial costs and, whenever possible, should provide an accuracy of +50 percent to -30 percent. Sensitivity analysis may be warranted if a cost estimate might vary significantly with relatively small changes in the underlying assumptions, especially those concerning the effective life of a remedial action, the O & M costs, the duration of cleanup, site characteristics (e.g., volume of contaminated material), and the discount rate *(RI/FS Guidance, page 6-12)*.

The actual process of selecting a Superfund remedy is the decision making bridge between development of remedial alternatives during the FS and documentation of the selected remedy in a ROD. The process begins with the identification of a preferred remedial alternative from among those developed in the FS. This preferred alternative is then presented to the public for comment in the form of a Proposed Plan. Based on the review of public comments, a final remedy selection decision is made and documented in a ROD.

Cost is a critical factor in the process of identifying a preferred remedy. In fact, CERCLA and the NCP require that every remedy selected must be cost-effective. A brief summary of the relationship between the nine remedy selection criteria and the five principal statutory remedy selection requirements will provide a useful context for a discussion of the role of cost in the remedy selection process. For a more detailed discussion of the nine criteria and the remedy selection process in general, see EPA's Remedy Selection Guidance.

Relationship Between the Nine Criteria and Statutory Requirements for Remedy Selection

During the remedy selection process, nine evaluation criteria are considered in distinct groups which play specific roles in working toward the selection of a remedy that satisfies the five principal statutory requirements. The nine evaluation criteria include two "threshold" criteria, five "balancing" criteria (including cost), and two "modifying" criteria (state and community acceptance), as illustrated in Exhibit 2. The modifying criteria are considered to the extent possible during the process leading up to and including the Proposed Plan, and are fully considered after public comments on that plan have been received. Following receipt and consideration of public comments, including any new information they might contain, the decision maker makes a final decision which is documented in the ROD.

The first two statutory requirements -- protection of human health and the environment, and compliance with ARARs (unless a waiver is justified) -- are embodied in the two threshold criteria. A remedial alternative must satisfy these two requirements to be eligible for further evaluation against the other seven factors.

Advantages and disadvantages of alternatives that satisfy the threshold criteria are balanced using the five balancing criteria, and the two modifying criteria (if there is enough information to consider these latter criteria in advance of the formal public comment process). This balancing determines which option represents the remedy that utilizes "permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable" (MEP) for that site *(40 CFR 300.430(f)(l)(ii) (E))*. The decision maker considers the statutory preference for treatment as an "overlay"to inform and direct this balancing (id.).

The alternatives are also separately evaluated against a subset of the criteria to make the determination of which option(s) satisfy the statutory cost-effectiveness. A remedial alternative is cost-effective if its "costs are proportional to its overall effectiveness" *(40 CFR 300.4300(f)(1)(ii)(D))*. Overall effectiveness of a remedial alternative is determined by evaluating the following three of the five balancing criteria: long-term effectiveness and permanence; reduction in toxicity, mobility and volume (TMV) through treatment; and short-term effectiveness (See Exhibit 3). Overall effectiveness is then compared to cost to determine whether the remedy is cost-effective (id.).

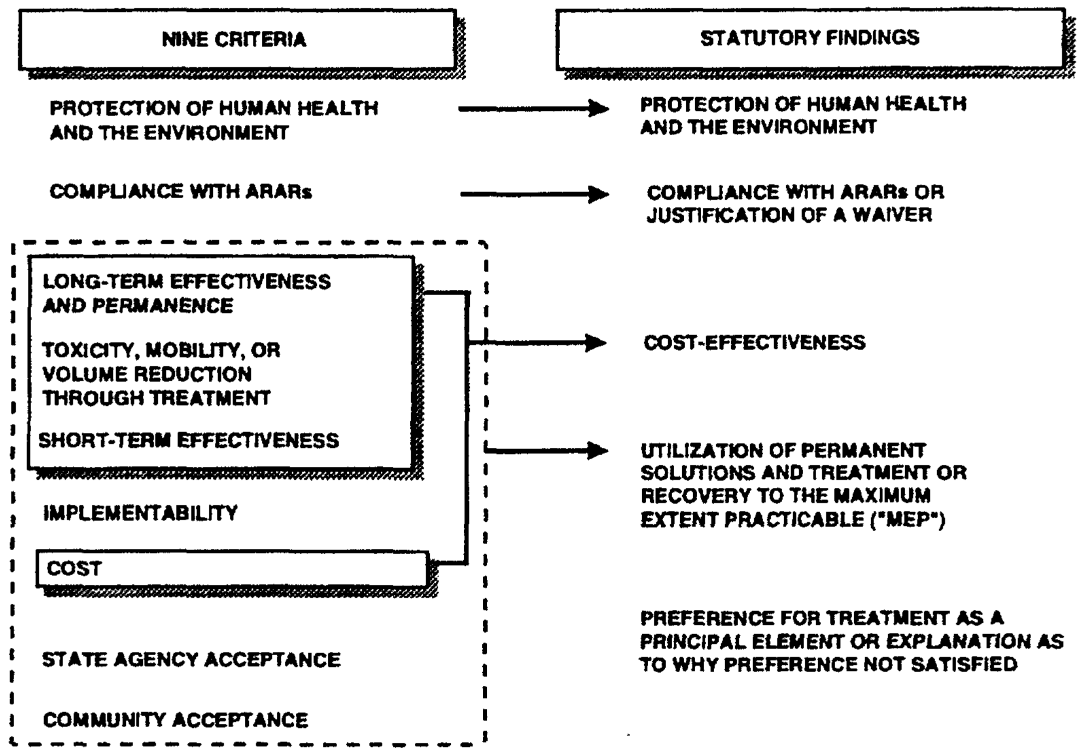
Cost considerations are therefore factored into the balancing of alternatives in two ways. Cost is factored into the determination of cost-effectiveness, as described above. And, cost is evaluated along with the other balancing criteria in determining which option represents the practicable extent to which permanent solutions and treatment or resource recovery technologies can be used at the site. This balancing emphasizes two of the five criteria (long-term effectiveness and permanence, and reduction of TMV through treatment) *(40 CFR 300.430(f)(1)(ii)(E))* However, in practice, decisions typically will turn on the criteria that distinguish the different cleanup options most. The expectations anticipate some of the likely tradeoffs in several common situations, although site-specific factors will always play a role.

The Role of Cost in Determining Whether to Waive ARARs

Section 121 of CERCLA specifies that all remedial actions must "meet any Federal standards, requirements, criteria or limitations that are determined to be legally applicable or relevant and appropriate requirements." Specific statutes cited in CERCLA that might present such an ARAR include the Solid Waste Disposal Act~ the Toxic Substances Control Act, the Safe Drinking Water Act, the Clean Air Act, the Clean Water Act, and the Marine Protection Research and Sanctuaries Act. In addition to the Federal ARAR requirement, remedial actions must meet any applicable or relevant and appropriate promulgated State standard, requirement, criterion or limitation if it is more stringent than the corresponding Federal requirement. As previously discussed, compliance with ARARs is one of the two threshold criteria for the selection of a preferred remedy.

Exhibit 2

RELATIONSHIP OF THE NINE CRITERIA TO THE STATUTORY FINDINGS



Cost is not a factor in the identification of ARARs. However, CERCLA authorizes the waiver of an ARAR with respect to a remedial alternative if any one of six bases exist (See Exhibit 4). As described below, cost may be a consideration with respect to determining whether a technical impracticability, equivalent level of performance, or Fund-balancing waiver is warranted.

1. Technical Impracticability

Cost is relevant to the technical impracticability waiver, because engineering feasibility is ultimately limited by cost. EPA has stated that cost can be considered in evaluating technical impracticability, although it "should generally play a subordinate role" and should not be a major factor unless compliance would be "inordinately costly" *(55 FR at 8748, March 8, 1990)*. Thus, the role of cost in evaluating technical impracticability is more limited than in the general balancing of tradeoffs with respect to the remedy selection criteria, but cost may be considered in certain cases.

2. Equivalent Level of Performance

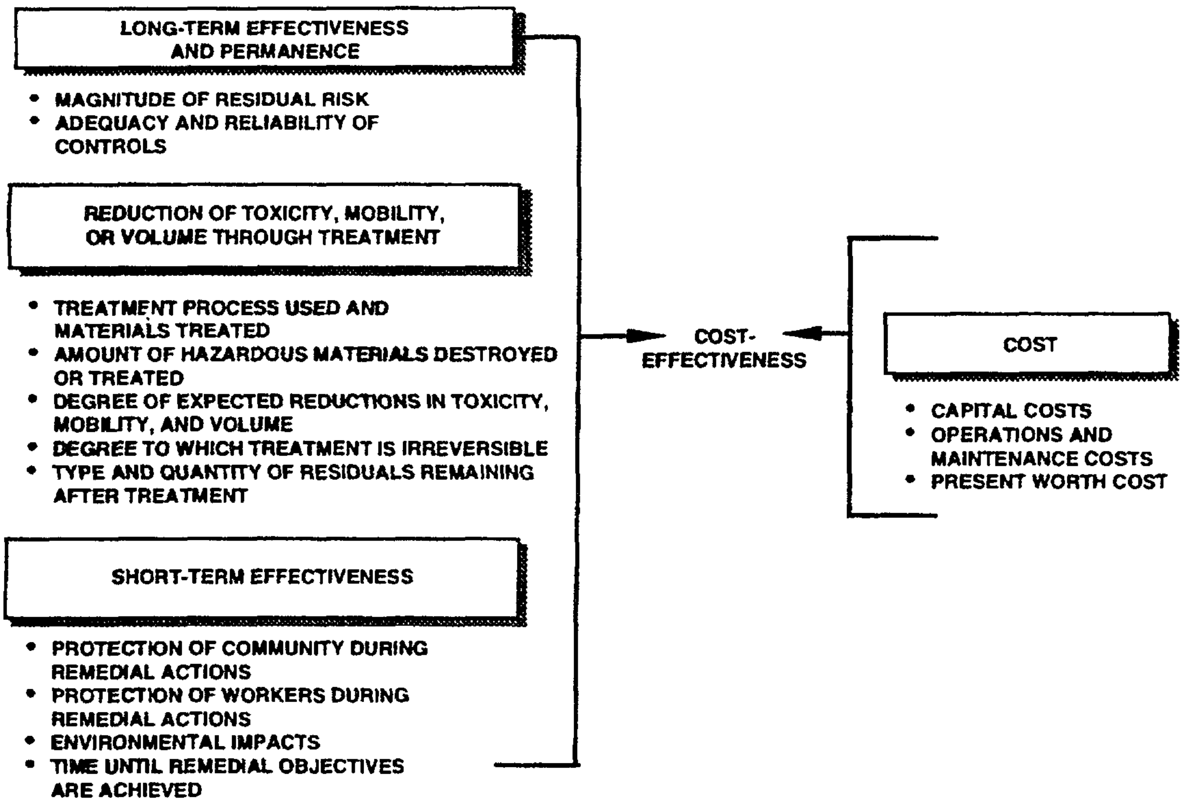
This waiver is available when an alternative will provide a level of performance equivalent to that required by the ARAR, but through an alternative design or method of operation. While cost is not considered in evaluating equivalence, this waiver can provide cost-saving flexibility in selecting remedies. Alternative, less expensive technologies that attain the same outcome (e.g., concentration of residuals) should be explored before concluding that a highly costly approach must be adopted because it is an action-specific ARAR.

3. Fund Balancing

For Fund-financed remedies, the fund-balancing waiver may be invoked when compliance with an ARAR would not provide a balance between the need to provide protection at a site and the need to address other sites. EPA's policy is to consider this waiver when the total cost of a remedy is greater than four times the national average cost of remediating an operable unit (currently, 4x$10 million, or $40 million), or in other cases where "EPA determines

Exhibit 3

ELEMENTS OF THE CERCLA REMEDY SELECTION COST-EFFECTIVENESS DETERMINATION



that the single site expenditure would place a disproportionate burden on the fund" *(55 FR at 8750).*

Consideration of Cost in Determining the Approach to Complying with ARARs

Even when waivers are not available, the NCP provides opportunity for cost-savings in achieving cleanup goals. For example, the NCP requires cleanup to relevant and appropriate Maximum Contaminant Levels (MCLs) and non-zero MCL goals (MCLGs) when remediating contaminated ground water whose beneficial use is as a drinking water source. However, the time frame over which the MCLs must be achieved may be adjusted, depending on such factors as whether the aquifer is currently being used or likely to be needed in the near future. In some cases, allowing for an extended time frame to achieve cleanup standards provides the opportunity to develop less intensive, lower cost alternatives.

• RECENT SUPERFUND REFORMS THAT PROMOTE COST-EFFECTIVENESS

The Administrative reforms announced in October 1995 include several initiatives that are intended, in part, to control remedy costs and further facilitate the achievement of cost-effective cleanup.

National Remedy Review Board

The National Remedy Review Board brings together senior EPA technical and policy experts to review and make recommendations on proposed cleanup actions at sites where the estimated cost for the preferred alternative is more than $30 million, or more than $10 million and 50% greater than the cost of the least costly, protective, ARAR-compliant alternative. Regional decision makers are expected to give the Board's recommendations substantial weight. However, other important factors may influence the final Regional decision, such as public comment or technical analysis of remedial options. This reform does not supersede any delegated decision making authority.

Remedy Selection "Rules of Thumb and Management Review Triggers"

Rules of thumb consist of key principles and expectations corresponding to three major policy areas in the remedy selection process: assessment and management of risk; treatment of principal threats versus containment of low-level threat waste; and ground water response actions. The purpose of this initiative is to promote consistently reasonable, and cost-effective decision making through the appropriate application of national policy and guidance. In addition, EPA is developing a set of "Management Review Triggers" that will flag senior EPA management attention to specific aspects of proposed remedies that should be examined closely to ensure they are justified by site-specific conditions. Together, rules of thumb and management triggers will become part of a standard list of Superfund issues on which Headquarters, Regions and States work together to ensure appropriate application of national policy and guidance.

Updating Remedy Decisions

The purpose of this reform is to encourage Superfund RODs. These updates are intended to bring past remedy decisions into line with the current state of knowledge with respect to remediation science and technology, and in so doing to improve the cost-effectiveness of site remediation while ensuring reliable protection of human health and the appropriate changes to remedies selected in existing environment. The primary focus of the "Update" reform effort will be ground water sites, as ground water science has advanced a great deal since the inception of the Superfund program. Three basic types of updates will be emphasized, although other types of updates are not excluded: a) where new remediation technology is available; b) where remediation objectives or approaches need revision; and c) where streamlining of a ground water monitoring program is reasonable.

Exhibit 4

BASES FOR ARAR WAIVERS

1. The alternative is an interim measure that will become part of a total remedial action that will attain the ARAR;

2. Compliance with the requirement will result in greater risk to human health and the environment than other alternatives;

3. Compliance with the requirement is technically impracticable from an engineering perspective;

4. The alternative will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, or limitation through use of another method;

5. With respect to a state requirement, the state has not consistently applied, or demonstrated the intention to consistently apply, the promulgated requirement in similar circumstances at other remedial actions within the state; or

6. For Fund-financed response actions only, an alternative that attains the ARAR will not provide a balance between the need for protection of human health and the environment at the site and the availability of Fund monies to respond to other sites.

Attachment 2
Selected ROD Summaries Reflecting Alternate Remedial Technologies

Utah Power & Light/American Barrel, UT

WEST GROUP ABSTRACT:

REPORT NUMBER: N/A
REGION: 08
DATE: July 7, 1993
SITE: Utah Power & Light/American Barrel, UT
LOCATION: Salt Lake County
MEDIA: soils, groundwater
CONTAM: benzene, cyanide, inorganics, metals, napthalenes, PAHs, PCBs, pesticides, phenols, styrene, SVOCs, VOCs
COST: capital - $7,747,000; O&M - $2,836,000; present worth - $10,583,000

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Utah Power & Light/American Barrel Site, Salt Lake City, Utah

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Utah Power & Light/American Barrel Site in Salt Lake City, Utah, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site.

The Utah Department of Environmental Quality concurs with the remedy selected by the U.S. Environmental Protection Agency (EPA).

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the Record of Decision (ROD). may present an imminent and substantial danger to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The objective of this Record of Decision (ROD) is to provide a remedy to address all contamination caused by previous site activities located on the American Barrel Yard and adjacent properties which affect surface soils, subsurface soils, and groundwater. Contamination from historical operations and contaminant sources left on-site at the time of abandonment have migrated into soil and groundwater. Remediation willbe to the extent of contamination emanating from the American Barrel Yard and Denver Rio Grande and Western properties.

The response actions described in this ROD will permanently address all principal threats through treatment. Soil contamination will be reduced to health based levels for all contaminants of concern. These levels are based on a future industrial use of the site but will provide for future residential development with acceptable risks within EPA's risk range of 10^{-4} to 10^{-6}. Groundwater remediation levels are based on the Safe Drinking Water Act maximum contaminant levels or acceptable risk levels for future residential exposure.

The major components of the selected remedy include:

- Excavation of soils which are principal threats based on visual observation, to the extent possible given physical limitations resulting from locations of existing railroad lines, or until the concentrations of EPA target compound list PAHs are below 9,000 mg/kg. The quantification of principal threats is based on EPA guidance, "A Guide to Principal Threat and Low Level Threat Wastes" which suggests defining principal threats as having a risk of 10^{-3} or greater.

- Excavation of soils exceeding health based remediation levels, based on a 10worker exposure, that have a potential exposure pathway. Soils down to a depth of 10 feet are considered to have an exposure pathway.

- Treatment of excavated soils through offsite recycling of soils into a cold mix asphalt product suitable for paving roads. Incorporation of contaminated soils as a raw material into the asphalt product involves treatment through solidification.

- If any RCRA characteristic hazardous wastes are encountered, these contaminated soils will be shipped offsite for incineration and will not be utilized in the asphalt treatment process.

- Soil vapor extraction (SVE) will be used to remediate principal threat light non-aqueous phase liquid (LNAPL) contamination. Location of the SVE extraction wells will be based on a principal threat definition where benzene in soils exceeds 10^{3} risk levels for residential exposure to groundwater. In conjunction with SVE, groundwater will be extracted from vapor extraction wells to enhance the SVE process. Off-gas from the SVE system will be treated prior to discharge to the atmosphere.

- Groundwater extracted from SVE wells, water pumped from excavations, and decontamination water will be treated to POTW discharge standards and then discharged to the Salt Lake City POTW for further treatment.

- The dissolved phase aqueous groundwater contamination plume is expected to naturally attenuate once the principal threat sources for groundwater contamination are remediated. If monitoring of groundwater contamination indicates that natural attenuation is not restoring groundwater to remediation levels, additional source removal or more active groundwater remediation may be required.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, except certain requirements for RCRA waste piles where a waiver is appropriate based on 40 C.F.R. § 300.430(f)(1)(ii)(C)(4). The selected remedy will attain a standard of performance that is equivalent to that required under the otherwise applicable standard. This remedy is cost effective, utilizes permanent solutions and alternative treatment and resource recovery technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will not achieve the remediation levels for groundwater within five years, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. Five-year reviews will be conducted as required under Section 121(c) of CERCLA and 40 C.F.R. § 300.430(f)(4)(ii) of the National Oil and Hazardous Substances Contingency Plan.

Jack W. McGraw
Acting Regional Administrator
EPA Region VIII
Date 7/7/93

Dianne R. Nielson, PhD
Executive Director
Utah Department of Environmental Quality
Date 7/19/93

THE DECISION SUMMARY

RECORD OF DECISION TEXT

I Site Name, Location, and Description

The Utah Power and Light/American Barrel Site (UP&L/ABS or the site) is an approximately four-acre parcel in Township 1 North, Range 1 West, Section 36 in Salt Lake City, Utah (Figure 1). The site is defined as the American Barrel Yard and the extent of contamination originating from past activities on the yard. The city block bounded by North Temple, South Temple, 5th West and 6th West streets is referred to as the study area.

The study area is divided into geographic areas consisting of the American Barrel Yard (ABY or yard), the Denver and Rio Grande Western Railroad property or Southeast Area (SEA), the Union Pacific Railroad property or Northwest Area (NWA), the residential area and the industrial area or Deseret Paint Site. (Figure 2).

The principal topographic features of the site are a gentle (1%) slope towards the Jordan River (one mile to the west) and a surface cut up to 8 feet deep for the Denver and Rio Grande railroad track along the eastern boundary of the yard. The railroad track just outside the western border of the ABY is at grade.

The ABY boundary is marked by a secured chain link fence; gates are located at the property's southwest corner and the middle of its northern edge. The yard is sparsely vegetated and while there are no intact buildings or large trees remaining within the fenced yard, there are several remnants of structures in and around the yard.

Residential lots and one light industrial lot are present along the western boundary of the study area. Surface features in this area include small buildings, mixed grass and gravel yards, old shade trees in some yards, and wood or sheet metal fences.To the north lies a vacant lot, formerly an auto wrecking property area, which is partially bounded by a woven wire fence and covered with sparse vegetation and bare soil.

The Union Pacific Railroad Company property comprises the area west and north of the ABY. This area is sparsely vegetated and the only surface features are the railroad tracks and overhead lines. Southeast of the ABY is the Denver and Rio Grande Railroad property. There are two small buildings in this area used intermittently by railroad personnel. The lot is sparsely vegetated and includes stone foundation remnants and some paved portions along the eastern boundary. The cut for the railroad track exposes old building foundations. Gravel-size ballast underlies all of the railroad tracks at this site.

City property forms a paved border around all four sides of the study area. Sixth West Street receives moderate traffic and forms the western boundary of the study area. The North Temple Street overpass carries traffic along the study area's north side, with a paved but only occasionally used right-of-way at ground level. The east and south margins of the study area contain railroad tracks just outside the paved right-of-way.

The nearest population to the site are those residents who live in the homes which lie 200 feet west of the ABY. There are also a number of transients who frequent the area. In the past, transients may have had extensive contact with on-site media. However, under current conditions, there is a fence around the ABY, to discourage trespassers and little on site which would attract visitors.

Figure 1. SITE LOCATION MAP

Figure 2. MAP OF ABS SHOWING LOCAL PROPERTY OWNERSHIP AND PRINCIPAL SOURCE AREAS

II Site History and Enforcement Activities

History of Site Activities

Activities began at the UP&L/ABS as early as 1873 and continued until 1987. The first process to be conducted on the site was coal gasification. The major features of this operation included coal storage sheds, a gas-o-meter (gas holder), tar wells, a coal tar still, the gas works (which included the retort house, exhauster room, condenser, lime house, and tar scrubbers), and the purifying house. The gas plant was located on the American Barrel Yard, the SEA, and a portion of the NWA. Locations of these structures are depicted on Figure 3. The gas-o-meter was a buried tank used to store gas following production and before metering out to customers. It was built of 30 inch thick brick masonry construction topped with sandstone building stone. The process of cooling the gas produced a tar/water condensate which was separated in the tar well. The tars were subsequently used as fuel, sold, or managed on site. The coal gasification plant included a distillation procedure to separate usable oils from tars. The final purification step in coal gasification involved a purifying house. In this step, the gas was passed through long, shallow boxes of hydrated iron oxide, thereby producing ferric sulfide. By the early 1900s this step was eliminated by switching to a scrubber technology.

Normal coal gasification procedures produced a variety of by-products having some commercial value. These included coke, ammonia, and lighter tars and sludges which were sold to refiners or to the public. Distillation by-products from the refinement of tars included toluene, naphthalene, anthracene, and phenols. By-products having no commercial value were also produced: ash, clinkers, heavy tars, sludges, lime sludges, spent iron oxides, liquid wastes, and steam condensates. These products were commonly disposed of in onsite pits and offsite landfills. Coal gasification operations ceased in 1908.

Creosote pole treating operations were conducted on the ABY and SEA as early as 1927**Creosote** was brought to the site in drums and stored within and just north of the northeastern corner of the ABY. Historical information shows there were two pole dipping tankson the ABY and possibly one tank on the SEA. Design plans indicated one was a semi-open tank with walls of 12-gage iron and wooden supports, buried six feet underground, and built on buried concrete walls. The other was a 400-gallon capacity steam heated tank used in conjunction with a boiler house and hot well tank to pressure treat poles in hot creosote. This tank was made of welded or riveted iron walls, painted with red lead paint (on the outside), and buried at a depth of 8.5 feet underground. It was tipped at an angle to allow for drainage into six inches of sand. No identifiable tank structures from this operation remain on site. The specific chemical composition of the creosote used at this site is unknown. However, typical creosote compounds include a variety of polycyclic aromatic hydrocarbons (PAHs), phenolic compounds, and nitrogen-, sulfur-, and oxygen-heterocyclic components. Locations of former creosote wood treating structures are shown on Figure 4.

Figure 3. COMPOSITE OF FORMER COAL GASIFICATION FACILITIES 1873-1908

Figure 4. COMPOSITE OF FORMER **CREOSOTE** WOOD-TREATING FACILITIES 1930-1957

When the pole treating operations ceased, the ABY was used as a storage yard for 55-gallon drums. Up to 50,000 drums were stored at any one time on virtually all portions of the ABY except for the yard margins, areas allowing for vehicles, and the extreme southwest extension of the crescent-shaped area. While no cleaning of drums or recycling of contents was reported to have taken place on the yard, some barrels contained residual products and leaks occurred. According to labels found on some of the drums, the variety of contents included: pesticides, solvents, resins, paints and paint removers, kerosene, gasoline, acetone, etc. It is assumed that the entire ABY was vulnerable to leaks and spills of the drum contents.

Several other activities have occurred within and immediately adjacent to the UP&L/ABS study area over the past century which may have had an influence on the study area properties. Some of these operations included: railroads, Deseret Paint Company, W.P. Fuller Oil Company, a Chevron gasoline station, Richard J. Howa Company underground storage tanks, and the existing Amoco diesel pipeline.

History of Federal And State Site Investigations

The U.S. Environmental Protection Agency (EPA) Field Investigation Team (FIT) conducted a site inspection in May of 1986 in response to discussions with the Utah Bureau of Solid and Hazardous Waste (BSHW). The BSHW is currently the Division of Environmental Response and Remediation (DERR) and is part of the Utah Department of Environmental Quality (UDEQ) (formerly the Utah Department of Health). The BSHW subsequently submitted a Draft Preliminary Assessment to the EPA, and the EPA Technical Assistance Team (TAT) observed drum characterization activities at the ABY being conducted by the American Barrel and Cooperage Company. The FIT followed up on the TAT observations of stained soils and product-containing drums by completing a two-phase site investigation in May, 1987 and February, 1998.

The FIT collected surface and subsurface soil samples and installed three monitor wells from which groundwater samples were collected. Analytical results indicated an abundance of PAHs and phenolic compounds present on-yard and extending to some undefined distance off-yard in surface soils. Concentrations of PAHs as high as tens of thousands of micrograms per kilogram (aeg/kg) were reported in soil samples. The FIT investigation report also indicated evidence of contamination by some heavy metals (cadmium, copper, chromium, lead, and zinc) and BTEX compounds (benzene, toluene, ethylbenzene, and xylenes). Chlorinated pesticides were found in some on-yard soils, indicating that contamination could have occurred from leaking drums. The investigation did not provide sufficient data to permit evaluation of the air pathway, although preliminary reports of surface soil contamination indicated that further study of the air pathway was warranted. Due to the diverse, toxic substances reported on many of the drum labels, FIT recommended further investigation of all media in the study area.

On-yard groundwater contamination was found consisting primarily of BTEX and styrene. Little information was collected to infer the extent of off-yard contamination. However, groundwater was determined to potentially be a principal pathway of concern. While the investigation demonstrated contamination of the shallow onsite aquifer, it did not characterize relationships to underlying or adjacent aquifer material.

Information provided by the FIT investigation indicated that surface water was not a pathway of concern.

On June 8, 1988 Utah Power and Light entered into an Administrative Order on Consent under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Section 106. Under this order, Utah Power & Light repaired portions of the existing fence and installed new fence to completely surround the yard. In addition, they cut down trees and vegetation at the yard.

The Utah Power and Light/American Barrel Site was proposed for listing on the National Priorities List (NPL) on May 5, 1989. The Site was finalized on the NPL on October 4, 1989.

Pursuant to the findings of contamination by the FIT investigation, an Administrative Order on Consent was entered into by Utah Power & light requiring them to conduct a Remedial Investigation/Feasibility Study (RI/FS) to characterize the extent of contamination and identify alternatives for cleaning up the site. The RI/FS report, which was completed in 1993, concluded that the contaminants found at the UP&L/ABS generally reflect the historical activities of the site. Results of the RI are presented in Section V.

As part of the RI/FS, EPA conducted a baseline risk assessment (BRA) in May of 1992 to estimate potential health and environmental risks which could result if no action were taken to clean up the site. The BRA indicated that if the site should be developed in the future, exposure to groundwater and soil could result in significant risks due to the contaminants present. Details of the BRA are summarized in Section VI.

Outcome of Potentially Responsible Party Search

Under CERCLA, a search is conducted to identify those responsible for the contamination in order to recover monetary compensation for the costs incurred to investigate and clean up the site. Results of an historical investigation are presented below.

The coal gasification plant was first operated by the Salt Lake City Gas Company from approximately 1873 until 1893. This company merged with two other utility companies in 1893 and became the Salt Lake and Ogden Gas and Electric Light Company, which operated the plant until 1897. Another merger took place in 1897 forming the Union Light and Power Company, which took control of the coal gasification facility and operated it until 1899. That same year, Union Light and Power became Utah Light and Power Company which had control of the facility until 1904. The company was then reorganized and merged with a railway company to become Utah Light and Railway Company. The plant was operated under this owner until 1908.

Railroad lines were present across the ABY and SEA throughout the operations of the gas plant. Rail cars were used to haul coal to the gas plant. Figure 3 is a composite from several plat maps showing the locations of railroad tracks.

The coal gasification plant ceased operating in 1908. From 1909 through 1929, the site was utilized as a storage yard for equipment, wood power poles, and other items. During this period the site was owned by Utah Light and Traction and leased by Utah Power and Light (UP&L) after 1917.

A **creosote** pole-treating facility was in operation in 1927 until the late 1950s. UP&L was leasing the facility from Utah Light and Traction and became the owner after 1944. The Phoenix Utility Company operated the first pole-treating operation using a “hot-dip” process to treat utility poles. This process was continued until 1938 when the operations were taken over by UP&L, which used a “cold-dip” process until 1957.

Pole treating operations ceased in 1958 and UP&L leased the crescent shaped yard to American Barrel and Cooperage, Inc., which used the yard for the storage of 55-gallon drums awaiting refurbishing at a local facility. In 1987, Utah Power & Light notified American Barrel of their intention to deny the renewal of their lease (which was to expire in 1988) and required that they remove all barrels and debris from the yard. During the barrel removal it was apparent that barrel contents had leaked and spilled onto the ground.

As a result of the historical investigation, the following companies are considered to be, Potentially Responsible Parties. (PRPs) for the UP&L/ABS and will be issued Special Notice Letters:
American Barrel & Cooperage Co.
Salt Lake City, Utah
Utah Power & Light Co.
Salt Lake City, Utah

Boise Cascade Corporation
Boise, Idaho
Union Pacific Railroad Co.
Salt Lake City, Utah
Denver & Rio Grande Western Railroad
Denver, Colorado
EBASCO Services Inc.
New York, New York

South Cavalcade Street Site, Houston, Texas

WEST GROUP ABSTRACT:

REPORT NUMBER: N/A
REGION: 06
DATE: September 26, 1988
SITE: South Cavalcade Street Site, Houston, Texas
LOCATION: Harris County
MEDIA: Soil, groundwater
CONTAM: NAPL, PAHs, metals - copper, chromium, arsenic, zinc, lead, VOCs
COST: Present Worth $13,000,000

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

South Cavalcade Street Site, Houston, Texas

STATEMENT OF PURPOSE

This decision document presents the selected remedial action for the South Cavalcade Street site in accordance with the Comprehensive Environmental Response, Compensation and liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986; and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, November 20, 1985.

The State of Texas (through the Texas Water Commission) has been provided an opportunity to comment on the technology and degree of treatment proposed by the Record of Decision and has no objection to the selected remedy (See Appendix D).

STATEMENT OF BASIS

This decision is based upon the administrative recordfor the South Cavalcade site. The attached index identifies the documents which comprise the administrative record. (See Appendix E).

DESCRIPTION OE THE REMEDY

The selected remedy will treat the health- and environment threatening contamination resulting from historical wood preserving operations at the site. Upon review of the information contained in the administrative record, EPA has determined that soil remediation using a combination of soil washing and in situ soil flushing and groundwater remediation using physical/chemical separation followed by filtration and activated carbon adsorption best fulfills the statutory selection criteria. Alternatively, if a potentially responsible party offers to implement an in situ biological treatment process for groundwater and can demonstrate that this process can be implemented and operated at an efficiency equal to or better than activated carbon, then this method will be used to remediate groundwater. The following is a summary of the proposed remedy:

Soil Remediation: During the initial stages of the remedial design, contaminated soil areas will be sampled to better define areas which require remediation. All areas will be remediated which either exceed the risk-based or leaching potential-based remedial goals. The risk-based goals is 700 ppm based on ingestion and direct contact with soils. The leaching potential-based goal will be determined by the EPA Toxicity Characteristic Leaching Procedure test. There are approximately 30,000 cubic yards which may need remediation.

In the southeast corner of the site, approximately 19,500 cubic yards of contaminated soils will be excavated and transported to the soil washing facility which will be constructed in the center portion of the South Cavalcade site. Wash water from the unit will be treated for removal of contaminants in the groundwater treatment system. The cleansed soils will be placed into the excavations and capped to maintain soil stability.

In the other parts of the site, contaminated soils will be remediated, using in situ soil flushing. The contaminants which travel into the groundwater will be extracted and treated in the carbon adsorption wastewater treatment system.

Groundwater Remediation: Groundwater will be remediated through extraction and treatment of contaminated groundwater, with reinjection to increase the hydraulic gradient and flow velocities. Approximately 50 million gallons of groundwater will need to be processed several times to recover and treat the non-aqueous phase liquids. Groundwater will be treated to drinkingwater standards and no detectable carcinogenic PAHs. Groundwater collection will continue until the groundwater contaminants have been recovered to the maximum extent possible. This point will be determined during the Remedial Action based upon operational experience in using the collection and treatment system. After this point is reached, the groundwater collection will cease and any remaining contamination be allowed to naturally attenuate to background levels.

Groundwater will be extracted and re-injected in a series of three groundwater extraction lines and two groundwater injection lines in the southern part of the site, and a minimum of one extraction line and reinjection line in the northern part. These wells will be screened in the shallow aquifer (approximately 10 - 20 feet below grade) and in the intermediate discontinuous sand lenses (approximately 50 feet below grade). The actual number of lines, locations and spacings of wells and well lines will be refined during remedial design.

The groundwater will be treated at an onsite wastewater treatment plant constructed in the center portion of the site. Groundwater will be pumped into a physical/chemical separator followed by a pressure filter and an activated carbon adsorption unit. Any nonaqueous phase liquids collected and separated from the groundwater will be recycled as creosote or incinerated offsite. The water will be treated to levels equal to Maximum Contaminant Levels and no detectable carcinogenic PAHs. Cleansed groundwater will be reinjected into the aquifer along with surfactants, to help recover the contaminants. Any excess water will be discharged to the drainage ditch leading into the off-site Hunting Bayou in accordance with an NPDES permit.

Alternate Remediation Plan: If a potentially responsible party can show that in situ biological treatment of soil and groundwater will provide equal or better performance and can further ensure that the implementability questions can be resolved, EPA will consider this remedial method. In this case, the performance goals and groundwater extraction system will be identical to EPA's selected remedy, but the actual method of treatment will differ. Groundwater will be treated above ground in the physical/chemical separator and injected with nutrients and oxygen (if necessary). The treated groundwater will be added to the contaminated soil and re-injected to encourage biological degradation of contaminants under the ground. Any excess water will be discharged into the city sewer system in accordance with a pretreatment permit and treated in a city municipal treatment plant.

Operation and Maintenance: The need for future operation and maintenance should be minimized since the primary sources of contamination will be removed through treatment. Site operation and maintenance will include installing a well screened in the 500 foot sand, monitoring groundwater wells and monitoring ambient air during remediation. The groundwater monitoring program will continue for at least 30 years unless it can be shown during the Remedial Action that some shorter length of time is appropriate. This sampling program will monitor the effectiveness of the selected remedy and provide the data necessary. If the monitoring shows leaching from soils now under existing structures, then the site will need to be revisited to determine if further remediation is necessary.

Additional site maintenance would include, but not necessarily limited to, inspections of surface vegetation, ensuring proper drainage, and proper operation of any actions such as groundwater treatment which may extend beyond the time required for the source control remedy. The details of these activities will be defined in the Operation and Maintenance Plan of the remedial design. The monitoring data will be evaluated during the Agency's 5-year review, in accordance with CERCLA Section 121 (c), to determine if any corrective action is necessary.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference for treatment that reduces toxicity, mobility or volume as a principal element. Finally, it is determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Robert E. Layton Jr., P.E.
Regional Administrator
Date: September 26, 1988

RECORD OF DECISION TEXT

1. SITE LOCATION AND DESCRIPTION

The South Cavalcade Street site is located in northeast Houston, Texas about one mile southwest of the intersection of Interstate Loop 610 and U.S. Route 59 (Figure 1). The site boundaries are Cavalcade Street to the north, Collingsworth Street to the south, and the Missouri and Pacific railroad lines to the east and west. The site is rectangular in shape with a base of approximately 600 feet, a height of 4.800 feet, and an area of 66 acres.

Figure 1. Site Vicinity Map

The site is generally flat. It is drained by two stormwater drainage ditches which flank the site on the east and west sides, and drain water into a flood control ditch which discharges into Hunting Bayou, a tributary of the Houston Ship Channel. Hunting Bayou is currently classified in the Texas water quality standards as a limited aquatic habitat.

The site is now used by three commercial trucking companies (Merchants Fast Motor Lines, Transcom Lines, and Palletized Trucking) which have erected four buildings on the northern and southern parts of the site. The central part of the site is not currently used. The surrounding areas are residential, commercial, and industrial properties. The nearest residential area is directly to the west. Commercial properties are located along the major thoroughfares as well as on-site.

2. SITE HISTORY

2.1 2.1 PREVIOUS SITE USE

The South Cavalcade site was used as a wood preserving and coal tar distillationfacility from 1910 to 1962. The wood preserving facility consisted of an operations area, a drip track, and treated and untreated wood storage areas. The operations area included wood treating cylinders, chemical storage tanks, and a wastewater lagoon; this area was located in the southwestern part of the site. **Creosote** and metallic salts were used in the operation. The drip track ran diagonally from the operations area to the northeast, and ended before the central part of the site. The coal tar plant was located in the southeastern part of the site.

In 1962, the Koppers Company ceased operation of the facility, and sold the site to Merchants Fast Motor Lines. The site was later sold, subdivided, and resold to the current property owners. Figure 2 shows current site ownership.

Figure 2. Site Ownership Map

2.2 2.2 RESPONSE AND REMEDIAL ACTIVITIES

In 1983, the Houston Metropolitan Transit Authority investigated the site for potential mass transit use and found evidence of buried **creosote**. The Texas Department of Water Resources conducted a further study and determined that the site may pose a threat to public health and the environment. Based on this information, TDWR referred the site to EPA for inclusion on the National Priorities List (NPL). EPA proposed the site to be added to the NPL in October 1984; the site was formally promulgated in June 1986.

EPA began the Remedial Investigation and Feasibility Study (RI/FS) in November of 1985. The Remedial Investigation included investigations into contamination in soils, groundwater, surface water and sediments, and air. The Feasibility Study evaluated several methods for remediating the site problems including containment and treatment technologies. The RI/FS ended in August of 1988 with the publishing of the reports on each.

2.3 2.3 ENFORCEMENT

EPA identified four potentially responsible parties (PRPs) in the initial stages of the RI. EPA issued an Administrative Order on Consent to the Koppers Company in 1985 to conduct a RI/FS.

EPA mailed copies of the proposed plan of action for this site to the PRPs on August 19, 1988. EPA will continue its enforcement activities by sending a Special Notice letter to the PRPs before the initiation of the remedial design. Should the PRPs decline to conduct future remedial activities, EPA will either take enforcement action or will provide funding for these activities while seeking cost recovery for all EPA-funded response actions from the PRPs.

WEST GROUP ABSTRACT:

REPORT NUMBER: N/A
REGION: 04
DATE: September 27, 1990
SITE: Cabot Carbon/Koppers Site, FL
LOCATION: Alachua County
MEDIA: groundwater, surface water, soil, sediment, air
CONTAM: arsenic, benzene, chromium, phenol, PCB, PAHs (carcinogenic and non), naphthalene
COST: Present Worth: $3,514,000

Cabot Carbon/Koppers Site, FL.

RECORD OF DECISION

DECLARATION

SITE NAME AND LOCATION

Cabot Carbon/Koppers Site
Gainesville, Alachua County, Florida

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Cabot Carbon/Koppers Site, in Gainesville, Florida, developed with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan. This decision is based on the Administrative Record for this site.

The State of Florida concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare and the environment.

DESCRIPTION OF THE REMEDY

The remedial action is proposed as both the first, and the final remedial action for the site. The function of this remedy is to treat, where feasible, contamination down to health based levels and to prevent exposure to those contaminants in areas where treatment is infeasible.

The major components of the selected remedy are as follows:

- Excavation of contaminated soils from the former North and South Lagoons on the Koppers facility;
- Soils washing of the soils from the former North and South Lagoons, bioremediation and, if appropriate, solidification/ stabilization of residual materials, and deposition of treated soils back onsite;
- In situ bioremediation and institutional controls for process areas on Koppers facility, including the former Cooling Pond and Drip Track Areas;
- Institutional Controls for the former Cabot Carbon facility;
- Extraction of contaminated groundwater from shallow aquifer, pretreatment if necessary, and discharge into Gainesville Treatment Utility (GRU) system. A plan for satisfying NPDES requirements will be developed in the Remedial Design, as a contingency against GRU not allowing this discharge;
- Provision for lining of North Main Street Ditch to prevent further discharge of leachate into the Ditch and Springstead and Hogtown Creeks; to be implemented if Ditch is, in the long term, to remain intact;
- Continued Operation and Maintenance of the North Main Street lift station until implementation of groundwater remediation system renders it superfluous;
- Confirmatory sampling of the intermediate aquifer, Springstead Creek, old Cabot lagoons area, and Wetlands/lagoon area.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that am legally applicable or relevant and appropriate to the remedial action, and is cost-effective.

This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. Four source areas am undergoing treatment technologies that will reduce the volume, toxicity and mobility of contaminants. For these source areas, this remedy satisfies the statutory preference for treatment as a principal element of the remedy. However, existing structures located on several of the source areas prevent effective treatment technologies from being implemented. For these source areas, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. For the groundwater remedy, this remedy does satisfy the statutory preference for treatment as a principal element of the remedy.

Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Date: September 27, 1990
Greer C. Tidwell
Regional Administrator

RECORD OF DECISION
CABOT CARBON/KOPPERS SITE
GAINESVILLE, FLORIDA

1.0 INTRODUCTION

The Cabot Carbon/Koppers Site (CC/K) was proposed for the National Priorities List (NPL) in October, 1981 and finalized in August 1983. A map of the site can be found on Figure 1.2-1. In 1983, EPA issued a Cooperative Agreement grant to the Florida Department of Environmental Regulation for the performance of a Remedial Investigation and Feasibility Study (RI/FS). During the implementation of the RI, the Florida Department of Transportation (FDOT) announced that they were going to widen North Main Street, which runs along the eastern border of the site, from two lanes to four lanes. This elicited a flurry of public opposition because the public was concerned that widening the road would cause exposure to contaminants that the road overlay. FDOT later decided to put the project on hold until EPA had selected a remedial action.

Figure 1.2-1. Site Plan

In 1987, the initial RI was completed. The EPA and FDER decided that additional data gathering activities were necessary before a comprehensive FS could be written. However, the Cooperative Agreement fund was depleted. The lead was then switched back to EPA, which then started negotiations with two major potentially responsible parties (PRPs) (Cabot Carbon Corporation and Beazer Inc. (formerly Koppers)) for the supplemental RI and the FS. The Consent Order between EPA and the PRPs for this work was signed in October 1988. The RI was approved in September 1989, the Risk Assessment (RA) was approved in February 1990 and the Feasibility Study in May 1990. The public comment period started August 8, 1990, and finished September 7, 1990. The public meeting to describe the preferred alternative was held August 14, 1990.

RECORD OF DECISION TEXT

2.0 SITE NAME, LOCATION AND DESCRIPTION

2.12.1 Area Land Use

The site is located within the northern part of the city limits of Gainesville, Florida. The Koppers half of the site is zoned industrial; it is the only parcel of land zoned industrial and is currently operating, in that area. The closest area zoned industrial is the Gainesville Industrial Area, which is several miles to the north. The former Cabot Carbon property, along with the marshy area to the north of the old Cabot facility and property cast and south of the site are zoned commercial. Theland to the immediate west of the site is zoned single family and multiple famil y residence. To the north-northwest of the site are scattered small businesses and a trailer park. To the west and northwest of the site, the adjacent property is residential, consisting primarily of single family housing. Commercial facilities border the site to the south and east along NW 23rd Avenue and North Main Street. To the northeast, the adjacent land is primarily undeveloped and heavily vegetated.

The Gainesville Regional Utilities (GRU) northern well field and treatment facility is located approximately 2.5 miles northeast of the site area. The facility, which is the municipal supply for the city of Gainesville, draws water from the Floridan aquifer.

The site area is relatively flat, ranging in elevation from 165 to 185 feet above mean sea level (ft-msl). Low, swampy areas are prevalent in the northeastern quadrant of the site and to the cast and northeast of the site in the undeveloped land segments. The primary surface water drainage in the area is Springstead Creek, which parallels the northern boundary of the site. Springstead Creek flows into Hogtown Creek. The North Main Street ditch, which flows into Springstead Creek, bounds the site along the eastern and northeastern perimeters. A secondary drainage ditch runs northeast through the KII property and discharges into Springstead Creek, a tributary of Hogtown Creek.

2.2 2.2 REGIONAL GEOLOGY

2.2.12.2.1 Regional Geologic Setting

Alachua County is underlain by several hundred feet of unconsolidated to semiconsolidated marine and nonmarine deposits of sand, clay, marl, gravel, limestone, dolomite, and dolomitic limestone. The oldest formation bearing fresh water in the area is the Lake City Limestone of Eocene Age. This unit is overlain by the younger Avon Park Limestone and Ocala Group (both of Eocene Age), the Miocene-Age Hawthorn Formation, and Plio-Pleistocene terrace deposits.

The principal geologic structure in central peninsular Florida is the Ocala Uplift, an anticlinal fold or arch whose crest traverses southwest of Alachua County. The Ocala Group, an extensive sequence of limestones and dolomites, is exposed at the ground surface approximately 5 miles southwest of the Cabot Carbon/Koppers site. From this area of limestone exposures, the ground surface rises to the northeast as the Ocala Group is overlain by the Hawthorn Formation and Plio-Pleistocene terrace deposits in the vicinity of the Cabot Carbon/Koppers site.

There are three aquifer systems in Alachua County: (1) the watertable aquifer, (2) the secondary artesian aquifer, and (3) the Floridan aquifer. The water-table aquifer is composed of PlioPleistocene sands and clayey sands. The secondary artesian aquifer is limited vertically and laterally in extent and consists primarily of a few limestone and sand units within the clays of the Hawthorn Formulation. The Floridan aquifer is comprised of several hundred feet of limestone and underlies the entire county. This aquifer is the most productive because it transmits and stores water more easily. The aquifer is confined where it is overlain by the Hawthorn Formation; it is unconfirmed where the Ocala Limestone is near the surface. In the immediate vicinity of the site, it is projected that the depth to the top of the Floridan aquifer is approximately 200 to 250 ft.

2.2.2 2.2.2 Site Specific Geology

Based upon the subsurface data available from the previous site investigations, two cross sections have been constructed to illustrate geologic conditions at the Cabot Carbon/Koppers site (see Figures 2.2-2 and 2.2-3). The surficial Pliocene and Pleistocene sediments that underlie the site consist of fine-tomediurn sand, silt, and clay. This unit is approximately 25 to 30 ft in thickness and exhibits increased clay content with depth. Underlying these surficial deposits is the Hawthorn Formation, which consists of a dense, light green, marine clay in the upper 10 ft, becoming interbedded with sandy clay stringers and phosphatic limestone. The surface of this unit appears to be dipping toward the northeast. A limestone unit, as determined from gamma logging, was encountered at a depth of 60 to 65 ft grading from thin seams of interbedded clay, sand, and limestone into massively bedded fossiliferous limestone (IT, 1987).

Figure 2.2-2. Geologic Profile A-A'

Figure 2.2-3. Geologic Profile 13-13'

2.2.3 2.2.3 Soil Types

The soils that make up the Cabot Carbon/Koppers site belong to the Millhopper-Urban Land Complex and the Wauchula-Urban Land Complex (Thomas et al., 1985). The term “complex” indicates that each mapping unit is an undifferentiated mix of the two soil types; in these cases, the individual soil series of the Urban Land.

The Millhopper Complex covers the majority of the Cabot Carbon property and the eastern two thirds of the KII property. This complex is characteristically drier than the Wauchula Complex with the water table expected to be below 60 inches for most of the year. Permeability is rapid in the surface and subsurface layers and slow in the subsoil layer.

The Wauchula Complex covers up approximately one third of the area. This complex is wetter than the Millhopper Complex, where the water table usually is within 40 inches of the surface. Permeability is rapid in the sand surface and subsurface layers and slow to moderately slow in the loamy subsoil.

2.2.4 2.2.4 Surface Water

The Cabot Carbon/Koppers site lies within the Hogtown Creek drainage basin, which covers an area of 15.6 square miles (Mi^2). The contact between the upland plateau and the transitional physiographic regions occurs at the scarp carved by erosion associated with Hogtown Creek drainage. Hogtown Creek drains southward across the transition zone into the western plains region, where it ultimately discharges directly to the Floridan aquifer by way of Haile Sink, approximately 10 miles downstream of the site area.

The Cabot Carbon/Koppers site has two drainage ditches which discharge to the Hogtown Creek system. The North Main Street ditch extends to the north along the eastern boundary of the site and discharges into Springstead Creek, which parallels the site's northern boundary. The second site drainage ditch transverses the KII property and also discharges into Springstead Creek at the northern property boundary. Springstead Creek discharges into Hogtown Creek north of the site.

2.2.5 2.2.5 Climate

The climate in north-central Florida is humid and subtropical. Summer temperatures are fairly uniform; afternoon temperatures generally reach 90 degrees F. Winter temperatures vary from day to day and frost and freezing temperatures normally occur several times a year. Mean annual precipitation is approximately 53 inches; with over half of that corning in the months of June through September. During this time of year, precipitation usually occurs during thunderstorms that can drop 2 to 3 inches of rain in several hours.

2.2.6 2.2.6 Local Habitat

Locally, the most significant feature influencing species composition on the Cabot Carbon/Koppers site is past and present land use management. As described previously, the site consists of approximately 99 acres of industrial and commercial activities, which limit or exclude the occurrence of natural resources. Retail commercial establishments occur on the former Cabot Carbon property within the southeastern portion of the site; consisting of support buildings, roadways, parking lots, and isolated landscaped areas. The KII facility dominates the western portion of the site supporting industrial-related buildings and structures. railroad siding, and nonvegetated open areas.

L.A. Clarke and Son, Inc., Spotsylvania County, Virginia

WESTGROUP ABSTRACT

REPORT NUMBER: N/A
REGION: 03
DATE: March 31, 1988
SITE: L. A. Clarke and Son, Inc., Spotsylvania County, Virginia
LOCATION: Spotsylvania County
MEDIA: soil, sediment
CONTAM: PNAs, benzene, creosote
COST: Capital - $2,295,000; O&M - $33,900 (present worth)

RECORD OF DECISION

Site Name and Location

L. A. Clarke and Son, Inc. - Spotsylvania County, Virginia

Statement of Basis and Purpose

This decision document presents the selected remedial action for the L.A. Clarke site developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Contingency Plan, 40 CFR Part 300. This decision is based on the Administrative Record for the L.A. Clarke site. The attached index identifies the items which comprise the Administrative Record upon which the selection of the remedial action is based.

The Commonwealth of Virginia has concurred on the selected remedy.

Description of the Selected Remedy

The selected remedy addresses the principal threats at the site by controlling contaminant sources. An estimated 118,000 cubic yards of soil and sediment require remediation. Sources to be remediated include two Resource Conservation and Recovery Act regulated units which constitute an estimated 2% of this volume. Additional remedial action addressing contaminant migration pathways (groundwater and downgradient sediment) shall be determined in a Second Operable Unit Record of Decision.

The selected remedy includes the following major elements:

- In situ soil flushing. utilizing a surfactant solution, of subsurface soils (creosote layer) underlying the process buildings;
    - Injection/recovery wells to direct washing solutions to the contaminated soils and then recover the contaminant-laden wash solution.
    - Design and use of a well system to attain a self-contained flushing scheme to prevent environmental impacts.
    - A wastewater treatment system to remove contaminants from washing solutions for recycling of solution back into the process. Disposal of treatment residuals is dependent on post-treatment characterization.
- In situ biodegradation in the **creosote** layer area (following the in situ flushing).
    - Nutrient and oxygen-rich compounds shall be injected via the well system described above.
- On-site land farming of excavated-surface soils, sediments, and subsurface wetland soils. The main land farming operation will be placed in northeast area of site. Some soils may be land fanned inplace. The RCRA regulated soil pile and Westvaco Pond sediment shall be landtreated in place.
- **Creosote** contaminated bottom sediment in the RCRA regulated lagoon shall be biologically degraded in a tank.
- Excavation/dredging and consolidation of contaminated sediments (ditches 1, 2 and 3, and wetlands), subsurface wetlands soils, buried pit materials, and surface soils that are not remediated via in situ flushing/biodegradation and cannot be land treated in place:
    - Geotextile silt fences, sedimentation basins, and/or diversion/surface management to control off-site soil transport and divert surface-water flows.
    - Organic vapor monitoring.
    - Dewatering of sediments, treatment of water (if required), and on-site discharge of treated water.
- Erosion/sedimentation control (as described for excavation).
- Backfill excavated areas with treated soil and sediment. Cover backfilled areas with topsoil and revegetate.
- During and post treatment groundwater monitoring.

Should the on-site process building be removed, Alternative 4, Landfarming/Biodegradation (as described in this document) would be an equally preferable alternative and may therefore be implemented. The Commonwealth of Virginia concurs with this decision.

The EPA and the Commonwealth of Virginia are currently pursuing measures to ensure that on-going wood treatment operations at the L.A. Clarke site will not result in further contamination of soils and sediments, and as a result, groundwater and surface water.

Declaration

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment which reduces toxicity, mobility, or volume as a principal element. Finally, I have determined that this remedy utilizes permanent solutions and alternative treatment to the maximum extent practicable.

James M. Seif
Regional Administrator
EPA Region III
DATE: March 31,1988

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

RECORD OF DECISION TEXT

SITE LOCATION AND DESCRIPTION

The L A. Clarke wood treating site is located in Spotsylvania County, Virginia, approximately 2.5 miles south of Fredericksburg. The site is about 40 acres in size and is situated at latitude 38 degrees 14'05"N and longitude 77 degrees 25'35"E. The L. A. Clarke facility is situated approximately one-quarter mile east of Route 608 and north of Massaponax Creek.

A regional location map (Figure 1-1) shows the general location of the site. Figure 1-2 shows the location of the site on the USGS 7.5 minute quadrangle topographic map.

Residential communities are located 1000 feet northwest and cast of the site. Figure 1-3 shows the various structures and their relative locations on the site. Major site structures include the processing facility where lumber is treated, the soil waste pile and wastewater impoundment in the west-central position of the site and two major drainage ditches in the western half of the site.

Figure 1-1. Regional Location of the L. A. Clarke Site

Figure 1-2. L. A. Clarke Site Location on GuineaQuadrangle (USGS) MAP

Figure 1-3. L. A. Clarke Site Map

L. A. Clarke currently treats wood with a **creosote**/coal tar solution in the pressure treatment facility at the site. Available data indicates that only **creosote** has been used as a wood preservative on-site.

Surface runoff from the site flows into a series of drainage ditches which discharge into a wetland south of the site. Groundwater at the L. A. Clarke site flows in a southeasterly direction within two water-bearing zones separated by a low permeability clay stratum. The shallow aquifer flows beneath the operations area and surfaces at the southern property boundary in the wetlands area. Groundwater from the site also enters the drainage ditches which outfall in the wetland. A deeper aquifer flows under the site and the wetlands.

Water from the wetlands flows through several tributaries which flow to Massaponax Creek, which discharges into Ruffins Pond approximately 2 miles downstream. Ruffins Pond is used for recreational swimming and fishing. Westvaco Pond, not known to be used for fishing or recreation, lies immediately to the west of the site. Residential wells are located within 1000 feet of the site and utilized groundwater from the shallow aquifer.

SITE HISTORY

Wood preserving operations began at L. A. Clarke & Son, Inc. in June 1937 and have continued to date with only one inactive period (from April 1979 to June 1980). Until 1976, the property and facility was owned by the Richmond, Potomac & Fredericksburg (R,F & P) Railroad and leased to the operator of the facility, L A. Clarke & Son Inc.

Creosote contaminated soils and sediments at the L. A. Clarke site have resulted from spills and leaks over the past 50 years from facility operations, from process waste streams entering the drainage ditches, and from waste disposal onsite in pits.

In the early 1970s, wastewater treatment consisted of draining process wastewaters into two concrete-lined pits. Historical aerial photography indicates that these pits were present at least from 1953 through 1974, and are located north of the process facility. Overflow from the concrete pits went to an earthen pit, and excess water was discharged to drainage ditches and sprayed on the ground around the storage yard to control dust. Four additional waste pits have been identified in aerial photos dating back to 1937. All of these pits had been filled in by 1979.

In 1975, L. A. Clarke and Son, Inc., was issued a National Pollution Discharge Elimination System (NPDES) permit for outfalls from two drainage ditches on-site (see Figure 1-3). These permits are still in effect. The only toxic contaminant regulated by the permit of concern is phenol.

In 1979, a wastewater impoundment (i.e., tagoon) was constructed to separate **creosote** from process wastewaters. In 1980, L. A. Clarke and Son, Inc. was classified under RCRA as a treater of hazardous wastes because of the use of this impoundment. L. A. Clarke was issued EPA I.D. No. VAD007972482. In 1982, L. A. Clarke submitted a RCRA Part B Permit Application, which addressed the impoundment and a contaminated soil pile located south of the process area. The facility lost RCRA interim status on November 8, 1985 as a result of its failure to submit the certification required under Section 3005(e).

The RCRA-regulated soil waste pile was created when soils were excavated from the processing area and from ditch 2 along the northern property line. This work was conducted as part of a statemandated remedial action in 1982. The waste pile contains approximately 1,400 cubic yards of soil.

SITE CHARACTERIZATION

Physical investigations during the RI have led to the following conclusions regarding the drainage, soils and hydrogeology of the site:

- Surface topography is relatively flat due to extensive fill and grading operations.
- The site is underlain by 0 to 26 feet of alluvial gravelly sands on top of a 13- to 32-foot thick silty clay/clayey silt unit. The alluvium pinches out along the southern margin of the site, exposing the underlying clayey silt.
- A shallow water table aquifer flows to the southeast within the alluvial deposits, and continues, where the alluvium pinches out, into the adjacent fractured silty clay/clayey silt. A deeper aquifer underlies this unit.
- Free product **creosote** is visible on the alluvium-clay interface in non-production/disposal areas indicating that migration of **creosote** is, in part, controlled by the undulatory nature of the clay surface.
- **Creosote** is present 5 or more feet below the surface of the clayey silt/silty clay both next to the facility and along the southern site boundary. The **creosote** appears in sandy interbeds; and along microfractures in the clayey silt/silty clay.
- On-site soils and fill are permeable, which reduces, surface runoff. Ditches that drain the site maintain flow throughout the year and are, in fact, surface

manifestations of a shallow water table system. The high **creosote** levels in soils at the ditch outfalls (in the wetlands adjacent to Massaponax Creek) indicate that the ditches are a primary mechanism for off-site transport.

In all cases, the primary contaminants of concern are constituents of **creosote**, particularly polynuclear aromatic (PNAs) and benzene. Based on chemical analyses of surface and sub-surface soils, plant practices have apparently created the following contaminant source areas (and Selected Soil and Sediment Sample Results and Figures 4-9, 4-11 and 4-12):

Figure 4-9. Sampling Locations

Figure 4-11. Shallow Test Pit Location

Figure 4-12. Deep Test Pit, Trench Test Boring and Vibracore Location

- Burial of waste **creosote** in pits has resulted in relatively stationary pockets of elevated PNA concentrations and a source of soluble contamination, which is transported by infiltration to the groundwater. (See results for TP-06, TP-33 and TR-4.)

- Plant operations have included years of spills and leaks at the treatment cylinders. Free product in these areas has completely permeated subsurface soils down to the clay stratum. Horizontal migration of free product along the top of this stratum is evident, forming a "**creosote** layer" (see result for TB-12).

- Sample results also indicate substantial contamination of surface sediments in on-site drainage ditches, particularly 001 and 002, and at the outfalls of these ditches (see results for D11 and D12). A significant quantity of sub-surface sediment has been detected at the outfall of ditch 001 (see VC-01).

- Areas of relatively higher PNA concentrations in surface soil include areas around the process facility, the field southeast of the lagoon, and the wetlands near the outfalls. Surface soils in the process area become increasingly stained approaching the operations buildings due to the frequent transport in that area of freshly treated lumber. Surface soils in this area contain total PNA concentrations on the order of 5,000 mg/kg. Surface soils in the wetlands are heavily stained within 100 feet of the outfalls.

- PNA concentrations in excess of 5,000 mg/kg can be found in surface soils in the area southeast of the wastewater lagoon. This can be attributed to the spraying of wastewater from the lagoon when in service and the use of an earthen overflow pit, shown on historical overflights, directly south of the lagoon.

- C A soil pile, located west of the wastewater lagoon, consists of contaminated soils excavated by L. A. Clarke from areas surrounding the process facility. Soil samples taken from the file by previous investigators (Schnabel Engineering Associates) indicate the presence of PNAs in excess of 1,000 mg/kg and low levels of benzene. In addition, the RCRA regulated lagoon has been estimated to hold 278 cubic yards of **creosote** bottom sediment.

Chemical analyses have revealed the following about contaminant migration pathways:

- C Significant contaminant levels have been detected in wetlands tributaries receiving drainage from the site (see results for M02). Massaponax Creek sediments downstream of the site ranged from below detection to 12 mg/kg of PNA (detected by U.S. Fish and Wildlife Service).

- C A survey of bottom feeding fish from Westvaco Pond revealed carcinogenic lesions around the gills and mouth in several specimens. These abnormalities may be due to direct contact with **creosote** contaminated sediments. Sediment samples taken from the edge of the pond contained total PNA concentrations between 2 and 18 mg/kg. Areas of blackened soils and sediments have been observed at the water's edge.

- C Total PNA concentrations in the shallow aquifer ranged up to 1500 ug/l. Benzene ranged up to 100 ug/1.

- C Total PNA concentrations in the deep aquifer were below detection, with the exception of one detection of less than 10 ug/l. Followup sampling of the well revealed no PNAs. Benzene was not detected in the deep aquifer.

Cape Fear Wood Preserving Site, Fayetteville, NC

WEST GROUP ABSTRACT

REPORT NUMBER: N/A
REGION: 04
DATE: June 30, 1989
SITE: Cape Fear Wood Preserving Site, Fayetteville, NC
LOCATION: Cumberland County
MEDIA: soil, groundwater, surface water, sediment
CONTAM: PAH, copper, chromium, arsenic
COST: Present Worth - $14.9 million

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Cape Fear Wood Preserving
Fayetteville, Cumberland County, North Carolina

Statement of Purpose

This document represents the selected remedial action for this Site developed in accordance with CERCLA as amended by SARA, and to the extent practicable, the National Contingency Plan.

The State of North Carolina has concurred on the selected Remedy.

Statement of Basis

The decision is based upon the Administrative Record for the Cape Fear Wood Preserving Site. The attached index identifies the items which comprise the administrative record upon which the selection of a remedial action is based.

Description of Selected Remedy

Prior to initiating any remedial action on-site,a site survey will be conducted to determine the presence of any endangered plant species on-site. If endangered plant species are encountered, then the Department of the Interior/U.S. Fish and Wildlife Service needs to be consulted prior to initiating remedial action to decide how to proceed.

REMEDIATION OF HAZARDOUS MATERIALS, TANKS & PIPING

Off-site disposal of sodium dichromate - copper sulfate - arsenic pentoxide (CCA) salt crystals, the solidified **creosote** and asbestoscontaining pipe insulation. The CCA crystals and solidified **creosote** will be disposed of at a RCRA permitted landfill. The asbestos-containing pipe insulation will be disposed of at the Cumberland County Solid Waste Facility pursuant to the facilities specifications.

The tanks and associated piping, above and below ground, will be emptied, flushed and cleaned, including triple rinsing, to render the metal non-hazardous. The metal will then be cut and either sold to a local scrap metal dealer or disposed of at the Cumberland County Solid Waste Facility. For those tanks and/or piping that cannot be cleaned sufficiently to render them non-hazardous they will be transported to a RCRA permitted landfill for disposal.

The contents of the tanks and associated piping contains approximately 50,000 gallons of 3 percent CCA solution, and 15,000 gallons of CCA contaminated wastewater. A buyer of the 50,000 gallons of 3 percent CCA solution will first be pursued. If no buyer can be found, then the 50,000 gallons of 3 percent CCA solution along with the 15,OOD gallons of CCA contaminated wastewater will be treated on-site through the water treatment system set up for treating the pumped surface waters and extracted groundwater. All wastewater (i.e, cleaning equipment, etc.) generated by on-site activities will also be directed to the treatment system.

SOURCE CONTROL *(Remediation of Contaminated Soils)*

The preferred alternative for the remediation of contaminated soils/sediment is soil washing. The alternate source control alternative is a low thermal desorption process to remove the organics contaminants from the soil followed by either soil washing or a soil fixation/solidification/stabilization process to address the inorganics. The decision as to which source control alternative will be implemented will be based on data generated by the soil washing treatability study to be conducted during the remedial design.

Contaminated soils/sediment will be excavated, treated and placed back in the excavation. All wastewater generated will either be reused or treated on-site. Following completion of on-site remedial activities, those areas disturbed will be revegetated.

MIGRATION CONTROL *(Remediation of Contaminated Groundwater)*

Groundwater extraction will be accomplished through the use of well points in the upper (surficial) aquifer. Groundwater removal will be conducted in 10,000 square foot sub-areas at a time, until the entire contaminated surficial aquifer is addressed. The well points willbe moved from one area to another for subsequential dewatering.

Due to local contamination of the lower aquifer, the lower aquifer will be pumped following remediation of the overlying upper aquifer in this area. This will prevent potential contaminant drawdown to deeper depths.

A water treatment system will be established on-site. The system's influent will include contents of the tanks and piping, all wastewater generated due to remedial actions implemented, pumped surface water, and extracted groundwater. The level and degree of treatment will depend on 1) the level of contaminants in the influent and 2) the ultimate discharge point of the treated water. There are two water discharge alternatives for the treated water. The optimal choice is the local sewer system. The other alternative is to discharge the effluent to a surface stream. The range of treatment for the contaminated water includes biological degradation, air stripping, filtration through activated carbon filter, and metal removal through flocculation, sedimentation and precipitation. The point of discharge and the degree of treatment will be determined in the Remedial Design stage. The effluents, including both discharged water and/or air, will meet all applicable and relevant or appropriate requirements (ARARs).

Declaration

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference for treatment that reduces toxicity, mobility, or volume as a principal element. Finally, it is determined that this remedy utilizes permanent solution and alternative treatment technologies to the maximum extent practicable.

Green C. Tidwell
Regional Administrator
Date: June 30, 1989

RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
CAPE FEAR WOOD PRESERVING SITE
FAYETTEVILLE, CUMBERLAND COUNTY, NORTH CAROLINA

1.0 Introduction

The Cape Fear Wood Preserving (Cape Fear) Site was proposed for the National Priorities List (NPL) in June 1986 and was finalized in July 1987 as site number 572. The Cape Fear site has been the subject of a Remedial Investigation (RI) and a Feasibility Study (FS), both of which were conducted under the REM II contract. The RI report, which examined air, groundwater, soil, and surface water and sediment contamination at the Site and the routes of exposure of these contaminants to the public and environment was completed in October 1988. The FS, which develops, examines and evaluates alternatives for remediation of the contamination found on site, was issued in final draft form to the public in February 1989.

This Record of Decision has been prepared to summarize the remedial alternative selection process and to present the selected remedial alternative.

RECORD OF DECISION TEXT

1. 1 SITE LOCATION AND DESCRIPTION

The Cape Fear Site is located in Cumberland County, North Carolina, on the western side of Fayetteville near Highway 401 (Figure 1). It includes about nine acres of a 41-acre tract of land new the intersection of latitude 35 degrees 02'57"N and longitude 79 degrees 01'17"W. The site is adjacent to other industrial/commercial establishments as well as private residences. Four homes are located near the site. In addition, a subdivision named "Southgate" is located approximately a quarter of a mile south of the site and houses approximately 1,000 people. Figures 2 and 3 show the area and major site features.

Figure 1. Map Showing Site Location

Figure 2. Map Highlighting Area of the Site

Figure 3. Map Illustrating Features of the Site

Of the approximately 41 acres comprising the site, less than 10 acres were developed by the facility. The remainder of the site is heavily wooded with coniferous trees with a small swampy area northeast of the developed area. The site is highly disturbed in the vicinity of the plant facilities. The buildings are currently abandoned and in various states of disrepair. The swampy area consists of a seasonally flooded wetland dominated by rushes. The upland section of the site is sandy and well-drained. A site survey will be required prior to initiating remedial action to determine if endangered plant species exist on-site.

The terrain of the Cape Fear Site is predominantly flat, with drainage provided by a swampy area on the northeast side of the site and a man-made ditch to the southeast that extends southeastwardly to a diked pond. A variety of land uses exist around the Cape Fear Site. The properties to the north include an undisturbed pine forest, a concrete plant, and a few residential properties. To the east is a continuation of the undisturbed pine
forest. and to the west is farmland used for growing crops and raising livestock. To the south is another concrete plant as well as the Southgate subdivision.

1.2 SITE HISTORY

Operations at the Cape Fear Wood Preserving Site commenced in 1953 and continued until 1983. The Cape Fear Wood Preserving facility produced **creosote**-treated wood from 1953 until 1978 when demand for **creosote** treated products declined. Wood was then treated by a wolmanizing process using salts containing sodium dichromate, copper sulfate, and arsenic pentoxide: This treatment process is known as the copper-chromium-arsenic (CCA) process. The date the CCA process was initiated is unknown. Nor is it known whether the creosote and CCA processes occurred simultaneously or in succession.

Both liquid and sludge wastes were generated by these two treatment processes. Waste from the **creosote** process was pumped into a concrete sump north of the treatment unit (Figure 3). As liquid separated from the sludge, it was pumped into a drainage ditch that lies southeasterly of the developed portion of the site and discharges into a diked pond. Stormwater runoff from the treatment yard also appears to drain into this ditch. Waste from the CCA treatment process was pumped into a unlined lagoon north of the dry kiln and allowed to percolate into the ground.

In the summer of 1977, the site was determined to be contaminated with constituents of coal tar and coal tar **creosote**. State authorities ordered the owner/operator to comply with North Carolina law. As a result,the owner/operator changed operations to limit further releases, installed a new potable water well for a neighbor west of the site, and removed 900 cubic yard of creosotecontaminated soil from the treatment yard and the drainage ditch that parallels the railroad. The **creosote**-contaminated soil was transported for land-spreading to property leased from Grace Parker approximately 2.5 miles south of the site. The soil on this property was sampled as part of the RI. Low levels of polycyclic aromatic hydrocarbons (PAHs) were detected.

Sometime between 1979 and 1980, a new closed-circuit CCA plant was installed and the old **creosote** and CCA facilities were decommissioned. The new CCA plant was regulated under the Resource Conservation and Recovery Act (RCRA) as a small generator until 1983, when the company went out of business. The site was subsequently abandoned until the summer of 1988 at which time SECO Investment, Inc. purchased the property.

The Environmental Protection Agency (EPA) conducted a site reconnaissance and site investigation in October 1984. Surface water, groundwater, soil and sediment samples were collected from the northeast swamp, diked pond, lagoon drainage ditch and a domestic well west of the site (S.T. Jackson). PAHs, which are **creosote**-related compounds, and the CCA metals were detected in all samples. Consequently, EPA conducted an emergency removal action at the site in January and February 1985. This action included.

- Removal of **creosote** sludge from the **creosote** concrete sump;
- Removal of sludge from the lagoon to a depth of 7 feet, and solidification of the sludge with fly ash;
- Pumpage of lagoon water into storage tanks located south of the new CCA unit;
- Removal of contaminated soil from the drainage ditch that parallels the railroad tracks and at the culvert near Reilly Road;
- Removal of contaminated soils from a potion of the northeast swamp and stained areas in the treatment yard; and
- Back filling with clean sandy soil of areas where contaminated soil had been removed.

All contaminated soils and sludges removed were transported to the GSX hazardous waste landfill in Pinewood, South Carolina.

The NUS Corporation conducted an investigating of the site in May and October 1985. Soil, sediment, surface water and ground water samples were collected. Analytical results again showed that samples were contaminated with **creosote**- related compounds, arsenic, chromium and copper.

EPA conducted a second emergency response in September 1986 when site visits revealed that vandals bad shot holes in a 3,000-gallon creosote storage tank spilling approximately 500 gallons of **creosote** on the ground. The cleanup operation consisted of:

- Removal, solidification, and transport of approximately 10 cubic yards of **creosote**-contaminated sludge to an on-site metal shed east of the new CCA unit;
- Removal and transport of the **creosote** storage tank to the on-site metal shed;
- Excavation and grading of the area where the **creosote** tank had leaked;
- Pumping of approximately 15,000 gallons of CCA waste water from the CCA recovery sump into on-site storage tanks located south of the new CCA unit, and
- Containment of the CCA recovery sump within an earthen dike.

2.0 ENFORCEMENT ANALYSIS

Several Potentially Responsible Parties (PRPs) have been identified, including the Cape Fear Wood Preserving Company (no longer active), Johnson & Geddes Construction Company (no longer active), John R. Johnson, Doretta Ivey (wife of former president of the Cape Fear Wood Preserving Company -- deceased), and Dewey Ivey. Jr. (son of the former president -- deceased). Recently identified PRPs include SECO Investments, Inc. (SECO), Southeastern Concrete Products, Inc. (SE-LUM), Southeastern Concrete Products of Fayetteville, Inc. (SEFay), Mr. Steve Floyd, Mr. Louis Lindsey, and Mr. James Musselwhite.

In December 1984, EPA issued notice letters to the PRPs informing them of EPA's intention to conduct CERCLA remedial activities at the site unless the PRPs chose to conduct such actions themselves. The PRPs were sent notice letters rather than an administrative order because of their presumed inability to pay for remedial action. On June 5, 1989, these PRPs were sent RD/RA notice letters informing them that the Agency was considering spending Fund monies if they are not or incapable of conducting the project themselves.

American **Creosote** Works, Inc.

WEST GROUP ABSTRACT:

REPORT NUMBER - EPA/ROD/R04-89/055
REGION - 04
DATE - September 28, 1989
SITE - American Creosote Works, Inc
LOCATION - Escambia County
MEDIA - soil
CONTAM - organics, dioxin, PAHs, PCP
COST - present worth - $2,275,000 O&M - $319,000

Record of Decision

Declaration

Surface Soil Contamination Operable Unit

Site Name and Location:

American **Creosote** Works, Inc.
Pensacola, Escambia County, Florida

Statement of Basis and Purpose:

This decision document presents the selected remedial action for the American **Creosote** Works, Inc. Site in Pensacola, Florida, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for the site.

The State of Florida has concurred on the selected remedy. The information supporting this remedial action decision is contained in the administrative record for this site.

Assessment of the Site:

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an unacceptable risk to public health, welfare, or the environment.

Description of the Selected Remedy:

The remedy selected by EPA will be conducted in two separate operable units. This operable unit is the first of two operable units for the site. This initial operable unit addresses treatment of the contaminated surface soil and is fully consistent with all planned future site activities. Future site activities include treatment of the contaminated ground water and previously solidified sludges and underlying subsurface soil.

The major components of the selected remedy for this first operable unit are as follows:

C Excavating, screening, and stockpiling the contaminated surface soil

C Treatment of this contaminated soil by bioremediation

C On-site disposal of the treated soil in the excavated areas

C Support activities: remove debris, repair fence, sample drums containing drilling muds and properly dispose of contents, and repair existing clay cap.

Declaration:

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and it satisfies the statutory preference for remedies that employ treatment that reduce toxicity, mobility, or volume as their principal element.

Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Greer C. Tidwell
EPA Regional Administrator
Date 9-28-89

Record of Decision
The Decision Summary
American **Creosote** Works, Inc. Site

Pensacola, Escambia County, Florida

1.0 Introduction

The American **Creosote** Works, Inc. (ACW) Site was proposed for inclusion on the National Priorities List (NPL) in October 1981 and became final on the NPL in September 1983. In September 1985, EPA signed a Record of Decision (ROD) for remediation of all on-site and off-site contaminated solids, sludges, and sediments. Ground water contamination was not specifically discussed. The State of Florida was not in agreement with the ROD as developed at that time. Consequently, a Post Remedial Investigation (RI) was conducted in June 1988 by EPA to provide further information on the extent of contamination. A follow-up Risk Assessment was done utilizing the results of the Post RI. In August 1989, a Post Feasibility Study (FS) was completed to identify, develop, and evaluate alternatives for rernediation at the site. Also in August 1999, the Proposed Plan, which outlines these alternatives, was released to the public.

1.1 1.1 Scope and Role of Operable Unit

As with many Superfund sites, the problems at the ACW site are complex. As a result, EPA has organized the remedial work into two smaller units or phases, referred to as operable units. The first operable unit, which is addressed in this Record of Decision (ROD), will eliminate the potential for direct-exposure to the contaminated surface soil. The proposed action is consistent with plans for future work to be conducted at the site. The second operable unit is undergoing additional study to further define the applicability of remediadon technologies to the contaminated ground water and the solidified sludges and underlying subsurface soil.

This ROD has been prepared to summarize the remedial alternative selection process and to present the selected remedial alternative for the first operable unit.

RECORD OF DECISION TEXT

2.0 Site Name, Location, and Description:

The ACW site occupies 18 acres in a moderately dense, commercial and residential district of Pensacola, Florida. See Figure 2.1. The site is located about one mile southwest of the intersection of Garden and Palafox Streets in downtown Pensacola and is approximately 600 yards north of Pensacola Bay and Bayou Chico. Immediately north of the site is a lumber company, an auto body shop, an appliance sales and repair shop, and a wide storage area. Residential neighborhoods art immediately adjacent to the site on the east and south, and a yacht sales shop is southwest of the site. The residential population within a one mile radius was approximately 5,000 people in 1970. The approximate population in the area of the site was 1,056 in 1970. A total of 404 dwelling units were present in this same area in 1970.

The more pertinent features of the site are shown on Figure 2.2. The site is about 2,100 feet long, east to west, and an average of 390 feet wide, north to south. Primary access to the site is off Pine Street at its intersection with J Street. Originally, a railroad spur line of the Burlington Northern Railroad traversed the site to the west and east. The majority of site buildings, process tanks, and equipment were situated near the center of the site in an area designated as the main plant area. A few small work sheds, miscellaneous equipment, and debris lay about the remainder of the site. At the present, only two small buildings remain standing on the site.

Four surface impoundments were located in the western portion of the site. The main pond and the overflow pond, located adjacent to L Street, were used for disposal of process wastes and are 1.8 and 0.9 acres in size, respectively. During former plant operations, liquid wastes periodically overflowed and were drawn off from the two larger impoundments. The liquid wastes accumulated in the smaller 0.3 acre railroad impoundment and 0. 1 acre holding pond or were spread on the ground in spillage areas.

3.0 Site History

Wood-preserving operations were carried out at the ACW site from 1902 until December 1981. Prior to 1950, **creosote** exclusively was used to treat poles. Use of pentachlorophenol (PCP) started in 1950 and steadily increased in the later years of the ACW operations. During its years of operations, liquid process wastes were discharged into two unlined, on-site surface impoundments. Prior to 1970, wastewaters in these ponds were allowed to overflow through a spillway and follow a drainage course into Bayou Chico and Pensacola Bay.

Figure 2.1. SITE LOCATION

Figure 2.2. SITE LAYOUT

In subsequent years, wastewater was periodically drawn off the ponds and discharged to designated, on-site spillage areas. Additional discharges occurred during periods of heavy rainfall when the ponds overflowed the containment dikes.

In March 1980, considerable quantities of “oily/asphaltic/creosotic material” were found by the City of Pensacola in the ground water near the intersection of L Street and Cypress Street. In July 1981, the U.S. Geological Survey (USGS) installed nine ground water monitoring wells in the vicinity of the ACW site. Samples taken from the wells revealed that a contaminant plume was moving in a southerly direction toward Pensacola Bay.

In February 1983, the EPA Site Screening Section conducted a Superfund investigation. The investigation included sampling and analyses of on-site soil, wastewater sludges, sediment from the area drainage ditches, and existing on-site and off-site monitoring wells. Concurrent with this investigation, the USGS initiated a site and laboratory research study.

Because of the threat posed to human health and the environment by frequent overflows from the waste ponds, the EPA Emergency Response and Control Section performed an immediate cleanup during September and October 1983. The immediate cleanup work included dewatering the two large lagoons (main and overflow ponds), treating the water via coagulation, settling, and filtration with subsequent discharge of the treated water to the City of Pensacola sewer system. The sludge in the lagoons was then solidified with lime and fly ash. A temporary clay cap was placed over the solidified material. The Florida Department of Environmental Regulation (FDER) also assisted during the cleanup.

A Remedial Investigation/Feasibility Study (RI/FS) under CERCLA was completed in 1985 by EPA. In September 1985, EPA signed a Record of Decision (ROD) which specified that all on-site and off-site contaminated solids, sludges, and sediments would be placed in a RCRA (Resource Conservation and Recovery Act) landfill to be constructed on-site. The remediation activity described would have involved excavation of significant amounts of soil from residential areas adjacent to the ACW site. Ground water contamination was not specifically discussed. The State of Florida was not in agreement with the ROD as developed at that time.

Consequently, a Post Remedial Investigation (RI) was conducted in June 1988 by the EPA Environmental Services Division (ESD) to provide further information on the extent of contamination. EPA performed a follow-up Risk Assessment utilizing the results of the Post RI. In August 1989, a Post Feasibility Study (FS) was completed to identify, develop, and evaluate alternatives for remediation at the site. Using the results of the Post FS, EPA completed the Proposed Plan in August 1989, which outlined the alternatives under consideration as well as the preferred alternative.

3.1 3.1 Enforcement Activities

The earliest documented incident of a release of any type from the ACW site occurred in the summer of 1978 when a spill of liquids flowed onto a nearby street and then onto the property of a yacht sales company. A flood in March 1979 resulted in a similar spill. This incident resulted in increased regulatory attention to ACW by the FDER. In January 1981, the FDER completed a responsible party search, a title search, and a financial assessment for the site. In May 1982, the company, American **Creosote** Works, Inc., filed for reorganization in the bankruptcy court. In 1984, the bankruptcy court presented a final court stipulation for the approval of the litigants. The ACW site would be sold after cleanup and the proceeds would be divided among FDER, EPA, and the financial organizations holding the corporation’s assets. The stipulation was entered into in 1988.

In March 1985, the Burlington Northern Railroad was sent a notice letter informing them of their potential liability and requesting that they perform certain tasks at the site. Specifically, they were to remove railroad spur lines utilizing an EPA-approved work plan. The railroad spur lines, the equipment, and most of the buildings have been removed. At the present, only two small out-buildings remain standing on the site. EPA is investigating to determine whether any other PRPs exist.

Burlington Northern (Somers Tie Plant), Flathead County Montana

WESTGROUP ABSTRACT

REPORT NUMBER: N/A
REGION: 08
DATE: September 27, 1989
SITE: Burlington Northern (Somers Tie Plant), Flathead County, Montana
LOCATION: Flathead County
MEDIA: soils, groundwater, sediments
CONTAM: zinc, zinc chloride, creosote, PAHs
COST: Capital = $6,881,000; O&M = $811,000; Present Worth = $112,031,000

RECORD OF DECISION

DECLARATION

SITE NAME AND LOCATION

Burlington Northern (Somers Plant)
Flathead County
Somers, Montana

STATEMENT OF BASIS AND PURPOSE

This decision document represents the U.S. Environmental Protection Agency's selected and contingency remedial actions for the Burlington Northern (Somers Plant) Superfund Site ("the Site"), in Somers, Montana. This document is developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. Section 9601, et seq, (Superfund) and the National Contingency Plan (NCP), 40 C.F.R. Part 300. This decision is based on the administrative record file for the Site.

By signature below, the State of Montana concurs in this Record of Decision. All determinations reached in the Record of Decision were made in consultation with the State of Montana, which has participated fully in the development of this Record of Decision.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This response action is anticipated to be the final action for the Site. Other actions at the Site included the 1985 Superfund emergency removal in the swamp pond area (see Figure 3 in the Record of Decision Summary for locations of areas of the Site), after it was determined to constitute an imminent and substantial hazard to Flathead Lake, and the closure in 1988 of two wastewater impoundments at the Site under State Resource Conservation and Recovery Act (RCRA) authority.

Figure 3. Location of Disposal Areas at the Somers TiePlant

This response action addresses the remaining contamination by remediating soils, sediments and ground water, all of which have been determined to pose a potential threat to human health and the environment The selected remedy addresses the principal threats by removing the potential for direct contact with soils, by reducing the impact of the soils and sediments on ground water and surface water, and by treating the ground water.

Soils and Sediments

The major aspects of the selected "source control" or soil component of the remedy include:

- Excavation of approximately 11,700 cubic yards of contaminated soils and sediments. Volumes to be excavated include soils above the water table from the CERCLA lagoon, drip track, drainage ditch and beneath the retort building as well as sediments from the slouMAPgh.

- On-Site Biological Treatment Of Excavated Soils.

- Restoration and/or replacement of wetlands lost during remedial action and those lost during the 1985 emergency action. The restoration/replacement will be conducted in consultation with the U.S. Department of the Interior.

Ground Water

The major aspects of the "migration control" or ground water component of the selected remedy include:

- Installation and operation of an innovative hot water flushing and water treatment system to remove and treat available free **creosote** contamination from the water table aquifer in the CERCLA lagoon and swamp pond areas.

- In-situ biological treatment to degrade both contaminants adsorbed onto the aquifer matrix and residual contaminants dissolved in the ground water.

Ground Water Restrictions

Currently, there are no drinking water supply wells in the affected portions of the water table aquifer. However, institutional controls designed to prohibit the construction of new wells downgradient from the CERCLA lagoon and in the swamp pond area will be implemented and maintained until ground water quality returns to acceptable levels.

Monitoring

The ground water component of the selected remedy will require monitoring to assure that treatment is effective and that treatment proceeds until risk-based cleanup levels have been achieved and maintained. In addition, monitoring of the town's proposed new municipal wells in the bedrock aquifer will be instituted if testing indicates that drawdown in these well could cause the contaminated water table aquifer to affect the municipal supply. The municipal wells are expected to be installed and tested in the fall of 1989.

Contingency Remedies

The selected ground water component of the remedy involves two innovative technologies: hot water flushing and in-situ biological treatment. These technologies are expected to be successful at the Site. However, because of their unproven nature under the Somers hydrogeologic conditions, these technologies will require pilot testing to determine their effectiveness prior to full scale implementation.

Contingency Remedy A. If EPA determines, based on pilot testing, that ground water remediation is not practicable, soils swamp area and to approximately 30 feet in the CERCLA lagoon area, and downgradient. This excavation will remove the source of ground water contamination both above and below the water table, in addition to the excavation area outlined in the selected remedy. In this case, institutional controls designed to prevent the construction of drinking water wells downgradient from the CERCLA lagoon will be implemented and maintained until natural degradation returns ft aquifer to a usable condition. Under this contingency, the excavated soils will be incinerated on-site.

Contingency Remedy B. If, based on pilot testing, EPA determines that ground water remediation would only be practicable in the area of the CERCLA lagoon but not in the swamp area, most likely due to lower permeability aquifer materials, the swamp area soils .will be excavated to a depth of approximately 20 feet, in addition to the excavation areas outlined in the selected remedy. The ground water component of the selected remedy will then be implemented in the CERCLA lagoon area only. Under this contingency remedy the soils will also be incinerated on-site.

DECLARATION

The selected remedy and all the contingency remedies are protective of human health and the environment, attain and comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and are cost effective. The selected remedy satisfies the statutory preference for remedies which employ treatment that reduces toxicity, mobility or volume as a principal element and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Although Contingency Remedy A also involves treatment of soils, this remedy would not satisfy the statutory preference for treatment as a principal element of the ground water component of the remedy to the extent that ground water contamination downgradient from the CERCLA lagoon would not be treated.

Because the remedy will take longer than five years to reach health based cleanup levels and because contaminated beach sediments will be left in place, a review will be conducted five years after commencement of the remedial action. The review is to ensure that the remedy continues to provide adequate protection of human health and the environment.

Signature

James J. Scherer
Regional Administrator
U.S. EPA, Region VIII
DATE: September 27,1989

In Concurrence

Donald E. Pizzini, Director
Department of Health and Environmental Sciences
State of Montana
DATE: September 21, 1989

RECORD OF DECISION SUMMARY

RECORD OF DECISION TEXT

I. Site Description

The Burlington Northern (Somers Plant) Superfund Site (also commonly referred to as the Burlington Northern Somers Tie Plant or the Glacier Park Company Somers Tie Treatment Plant, hereinafter referred to as "the Site") is located in northwestern Montana in the unincorporated town of Somers, Flathead County (Figures 1 and 2). Fewer than 1,000 residents live in the community. The Site occupies approximately 80 acres within the community. Residential areas abut the Site on three sides. Areas known to be affected by contamination from the tic plant extend from the plant to the shoreline of Flathead Lake, a distance of approximately 1,200 feet. In addition, beach sediments contaminated by plant discharges extend approximately 150 feet into Flathead Lake. The Site is located partially in the floodplain of Flathead Lake. Flathead River enters Flathead Lake approximately five miles cast of Somers. Portions of the Site along Flathead Lake and in a slough area adjacent to the plant are wetlands. Ground water flows from the tie plant toward the lake and slough.

Figure 1. Regional location of BN-Somers Site

Figure 2. Burlington Northern Railroad Somers TieTreatment Plant

The Somers community is located in the Flathead Valley surrounded by the Rocky Mountains of western Montana. Flathead Lake and Glacier National Park (located approximately 30 miles to the north) are important recreational areas. The Flathead Valley economy depends primarily on lumber, farming and tourism. Flathead Lake covers an area of 300 square miles and is used for hydroelectric power generation at Kerr Dam in Polson, Montana. The lake is also used for recreational fishing and boating. The local beach area, which is part of the Site, was formerly used as a swimming beach, although it was closed to public access in 1985 by the property owners because of liability concerns. Most of the southern half of the lake area and shoreline is contained within the Flathead Indian reservation. A Federal Waterfowl Production Area occupies much of the north shore of Flathead Lake east of Somers. Waterfowl also breed in the slough area adjacent to the tie plant.

Flathead Lake is currently the source of the Somers municipal drinking water supply. The Somers Water District has indicated its intention to convert to a bedrock aquifer drinking water source in 1989. A bedrock well at the local school located approximately 1/4 mile north of the tie plant currently is the only well in Somers which is used as a source of drinking water. Six residences in Somers have private wells used for purposes other than drinking water. One of the six wells is completed in bedrock, the other five are completed in the shallow water table aquifer. None of these wells has thus far been shown to be affected by contamination from the site.

The main structures on the tie plant property include an office building, a retort building (which housed the wood treating equipment), a boiler house, three large insulated **creosote** product storage tanks and miscellaneous support buildings. Three wastewater impoundments and one sanitary lagoon were or are also located on site. The wastewater impoundments are discussed in the following section.

II. Site History and Enforcement Activities

The Somers tie plant was operated by Burlington Northern between 1901 and 1986. The plant treated railroad ties and other miscellaneous lumber products to protect the materials from weathering and insects. Treatment fluids used by BN included zinc chloride, chromated zinc chloride and **creosote**/petroleurn preservative mixtures. The treatment process generated wastewater primarily consisting of steam condensate containing zinc chloride or **creosote**. Other sources of process generated wastewater were floor and shop washings, drippage from ties pulled out of the retort and drippage from treated ties in storage. An average of 350 gallons of wastewater were discharged per day. Approximately 1,000 pounds of sludge from the retort was generated every one and a half to two years (ReTec 1989). Prior to 1971, BN discharged wastewater to a lagoon located immediately south of the retort building (the “CERCLA lagoon”). Overflow from this lagoon discharged through an open ditch into Flathead Lake. Sometime prior to 1946, a pond formed in the swamp area (the “swamp pond”) adjacent to Flathead Lake and waste material discharged through the open ditch accumulated here. The final disposition of retort sludge is uncertain. Some was reported to have been used to patch holes in local roads. The locations of the major, presently known disposal areas at the Site are shown in Figure 3.

BN abandoned the CERCLA lagoon and ditch in 1971 when the company constructed two new wastewater holding impoundments (the “RCRA impoundments”). In 1984 BN implemented a recycling system and stopped all wastewater discharges.

In February, 1984, the Montana Department of Health and Environmental Sciences (MDHES) sampled the Site soils. Based on the results of this investigation, the Site was proposed for inclusion on the Superfund National Priorities List in October 1984 (49 FR 40320, October 15, 1984). The proposed listing cited potential negative effects on Flathead Lake and the water supply for the town of Somers which is drawn from the lake.

In May, 1985, EPA, BN and Sliters (a corporation which owns a portion of the site) signed an Administrative Order on Consent (Docket No. CERCLA-VIII-85-02) providing for an Emergency Removal action in the area of the swamp pond adjacent to Flathead Lake.

The area was determined to pose an imminent and substantial hazard to Flathead Lake because of the presence of heavy **creosote** contamination in water and soil located within 20 feet of the shoreline. Pursuant to the 1985 Administrative Order, BN removed approximately 3,000 cubic yards of the most heavily contaminated soils and over 100,000 gallons of contaminated water from the swamp pond are and from a portion of the drainage ditch. The excavated areas were backfilled with clean soil and rip rap was installed alongthe lakeshore. The excavated materials were placed in the RCRA impoundments, which had been cleared and double-lined for this purpose. The contaminated water was processed at the plant to recover any usable materials and the soils were transferred to the BN RCRA-rcgulated facility in Paradise, Montana to await treatment.

In October, 1985, the EPA, BN and Sliters signed an Administrative Order on Consent (Docket No. CERCLA-VIII-85-07) for a Remedial Investigation and Feasibility Study (RI/FS). The purpose of the Remedial Investigation and Feasibility Study was to determine the nature and extent of contamination at the Site, to evaluate the impacts of contamination on public health and the environment and to formulate alternatives for remedial action. BN began conducting the work under EPA supervision in the fall of 1985 and completed its field investigations in the fall of 1988. Sliters provided access to their property for site investigations. A Remedial Investigation/Feasibility Study report, consisting of final Site Investigation and Exposure and Endangerment reports and public review draft Feasibility Study, was submitted to EPA in the spring of 1989 (Remediation Technologies, 1989). Correspondence between the EPA and BN regarding the Remedial Investigation/Feasibility Study is contained in the Administrative Record file.

The RCRA impoundments were filled in and covered with pavement by BN in 1988 pursuant to a closure plan approved by the MDHES. Subsequent to the closure of the RCRA impoundments, a ground water monitoring well located adjacent to the impoundments indicated that ground water was contaminated; therefore ground water corrective action was required. BN submitted a proposal for corrective action to the MDHES in February, 1989. In order to ensure coordination of the RCRA and CERCLA facets of site activities, the EPA has consulted with the MDHES and kept the agency involved in all CERCLA activities.

In June 1988, the EPA published a notice of intent to remove the Site from the proposed National Priorities List, because of its status as a RCRA-regulated facility. The MDHES, and various community groups have made requests to the EPA that the Site be retained on the proposed National Priorities List. As of the date of this Record of Decision, the Site has not been removed from the proposed list.

Koppers Wood Treating Facility, Galesburg, Illinois

WESTGROUP ABSTRACT

REPORT NUMBER: N/A
REGION: 05
DATE: June 30, 1989
SITE: Koppers Wood Treating Facility, Galesburg, Illinois
LOCATION: Knox County
MEDIA: soils, groundwater, surface water, sediment
CONTAM: dioxins, furans, carcinogenic polynuclear aromatic hydrocarbons (PNA's); noncarcinogenic PNA's, phenols, pentachlorophenol (PCP), naphthalene
COST: Present worth = $4,286,844

DECLARATION FOR THE RECORD OF DECISION (ROD)

SITE NAME AND LOCATION

Koppers Wood-Treating Facility
Galesburg, Illinois

STATE OF BASIS AND PURPOSE

This decision document presents the selected final remedial action for the Koppers Wood-Treating Facility site in Galesburg, Illinois, developed in accordance with the Illinois Environmental Protection Act, III Rev. Stat. 1983, ch. 111 1/2, pars. 1001 et. seq., CERCLA, as amended by SARA, and the National Contingency Plan (NCP) to the maximum extent practicable. This decision is based on the administrative record for this site. The attached index (Appendix C) identifies the items that comprise the administrative record upon which the selection of this final remedial action is based.

The U.S. Environmental Protection Agency (USEPA), Region V supports the selected remedy for the Koppers/Galesburg site.

DESCRIPTION OF SELECTED REMEDY

The final remedy at the Kopper's Wood-Treating Facility in Galesburg, Illinois consists of the following:

- Excavation of visibly contaminated soils plus a six-inch buffer layer to a depth that ensures effective mitigation of groundwater contamination from “hotspots” identified on-site (north **creosote** lagoon, drip track, northeast portion of pentachlorophenol (PCP) lagoon and area east of the retort building), samples will be taken to assess these mitigative efforts and to confirm final remediation to health-based levels; backfillingof excavated areas with “clean” soil, regrading of the “area of contamination” for positive surface drainage; revegetation. and maintenance of the affected areas.

- Conduct an on-site field scale biological treatment demonstration study with a biological monitoring program. Upon successful demonstration of technology, consolidation of excavated contaminated soils into a full scale cell through a phased loading approach. Upon treatment of the final lift of contaminated soil, implementation and maintenance of management measures as necessary.

- Construction and operation of a system of shallow interceptor trenches and deeper pumping wells to contain and extract contaminated groundwater from the site. Extraction will continue until established in-situ groundwater clean-up objectives are met. Extracted groundwater will be pretreated in the existing woodtreating facility wastewater system as necessary prior to conveyance to the Galesburg Sanitary District publically owned treatment works (POTW) for final treatment. Treated groundwater will meet established clean-up objectives for surface water discharge prior to release by the POTW. Maintenance of the groundwater remedial system; development and implementation of contingency plans for alternative on-site treatment should the POTW be unable to accept site wastewater in the future.

- Monitoring of groundwater within, and at the perimeter, of the “area of contamination” to assess the effectiveness of the groundwater remedy, development and implementation of contingency plans for collection of contaminated groundwater as necessary. Direct monitoring of extracted and pretreated groundwater prior to release to the POTW for quality compliance purposes.

- Application and enforcement of access and land use restrictions for the “area of contamination” in accordance with the terms of the anticipated Consent Decree with the responsible parties (RPs).

DECLARATION

It is the considered opinion of the State of Illinois, through the Illinois Environmental Protection Agency (IEPA), following consultation with USEPA Region V, that the selected remedy is protective of human health and the environment, attains Federal and State requirements that am applicable or relevant and appropriate for this remedial action (or invokes an appropriate waiver), and is cost-effective. This remedy is consistent with the State Contingency Plan. This remedy satisfies the federal statutory preference of CERCLA/SARA for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted by IEPA, in consultation with USEPA, within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Bernard P. Killian, Director
Illinois Environmental Protection Agency
DATE 6/28/89

DECLARATION STATEMENT

RECORD OF DECISION

SITE NAME AND LOCATION

Koppers Wood-Treating Facility
Galesburg, Illinois

STATEMENT OF BASIS AND PURPOSE

This decision document serves as United States Environmental Protection Agency (U.S. EPA) concurrence with and adoption of the remedial action decision for the Koppers site, as approved by the Illinois Environmental Protection Agency JEPA), and pursuant to sections 104(d) and 117 of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). IEPA approved this remedial action in conformance with: Illinois Environmental Protection Act; and it has provided U.S. EPA with documentation to demonstrate the State's selection of the remedy conforms with the requirements of the CERCLA, as amended by Superfund Amendments and Reauthorization Act (SARA), and the National Contingency Plan, to the extent practicable.

The State has undertaken response action at the Koppers Facility and has sought U.S. EPA concurrence in adoption of the remedy which has been selected. The U.S. EPA concurrence with the State's selected remedy is based upon the items listed in the attachment and the adequacy and completeness of those documents as represented by the State.

DESCRIPTION OF REMEDIAL ACTION

The selected remedy provides for final cleanup requirements related to the Koppers site, as provided below:

- Excavation of visibly contaminated soils with a six-inch buffer layer to a depth that will ensure effective migration of ground water contamination. Samples will be taken to confirm final remediation to health-based levels.

- Extraction and treatment of shallow and deep ground water until ground water clean-up objectives are based.

- Discharge of treated ground water to the Galesburg POTW that are consistent with pretreatment standards and/or surface water.

- Monitoring of ground water and bioremediation treatment.

- Application of access and land use restrictions for the “area of contamination.”

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate for this remedial action, and is cost-effective. This remedy satisfies that statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Because this remedy will result in hazardous substances remaining on-site, the State is expected to supply information such that the U.S. EPA can conduct a review no less than five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and environment.

Based on the information described above, U.S. EPA adopts and concurs with the decision the IEPA has made in the exercise of the States authority in selecting this remedy under an agreement between U.S. EPA and IEPA pursuant to section 104(d) of CERCLA for implementation of the remedy, attached hereto.

Valdas V. Adamkus
Regional Administrator
DATE June 30, 1989

KOPPERS WOOD-TREATING FACILITY
GALESBURG, ILLINOIS SITE
DECISION SUMMARY

RECORD OF DECISION TEXT

I. SITE NAME, LOCATION, AND DESCRIPTION

Site Description

The Koppers Company, Inc. (Koppers) Galesburg Wood-Treating Facility site is located approximately 2 miles south of the City of Galesburg, Knox County, Illinois. The location and vicinity maps of the Koppers/Galesburg site are shown in Figures 1 and 2, Appendix A, respectively. The Koppers site occupies an area of approximately 105 acres. The active tie treating area uses approximately 2 acres, with a large portion of the site devoted to railroad tie storage.

Figure 1. Location Map - Koppers Galesburg Site

Figure 2. Vicinity Map - Koppers Galesburg Site

The Koppers railroad tie treating facility is located on land owned by the Burlington Northern Railroad Company (BN), at the southern end of the BN railroad yard complex. Operational facilities and waste treatment/disposal areas are shown in Figure 3. Current operations include: the treatment cylinder building and drip track (A&S); the office building (B); storage tanks for **creosote** (D); water (E); wastewater (F and W); the storage yard for untreated ties (G); and the wastewater treatment system. Wastewater is piped to a tank where it is held prior to discharge to the flocculation basin. From the flocculation basin, the wastewater passes through the oil/water separator to the activated sludge treatment unit. The wastewater is discharged from this unit directly to the Galesburg Sanitary District publicly owned treatment works (POTW).

Figure 3. Site Map - Koppers Galesburg Site

Southeast of the Koppers site is the Steagall Landfill. This site is also located on BN property and has been included on the Illinois State Remedial Action Priority List (SRAPL). See. Figure 4 gives additional information on the land use of the surrounding area.

Figure 4. Land Use Surrounding Koppers Galesburg Plant

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Site History

The railroad tie treating plant, built in 1907, was operated by BN until December, 1986. At that time, Koppers leased the production plant from BN and took over operation of the facility. The treating operation consists of pressure treatment of railroad ties in treating cylinders utilizing a 70:30 mixture of **creosote** and coal tar. Previously, a 50:50 blend of **creosote** and number 6 fuel oil was used. During the period of 1971 to 1976, one of the three treating cylinders was converted to pentachlorophenol (PCP) use.

The key areas associated with past waste disposal practices are also shown in . These areas include the "BN slurry pond" (also known as the old **creosote** lagoon) (J): the north (M) and south (L) **creosote** lagoons; the PCP lagoon (I); the waste pile storage area (T) which has been consolidated in the north **creosote** lagoon area; two drainage ditches that have been backfilled and regraded, the interceptor ditch (R) and the Koppers ditch (P); and two former spray wastewater fields (H) & (N). The operation history of the plant's waste disposal arm is summarized in Table 1.

Table 1 - HISTORY OF ONSITE WASTED DISPOSAL, KOPPERS GALESBURG SITE

Site Number	Approximate Period of Use	Activity
J	1907-1966	Slurry lagoon that received discharge from the Lake Bracken water treatment. (Waste excavated in 1985 from BN slurry is currently stored on-site in gondola cars and on tarp in old Spray Field Area).
	1935-1975	Originally may have been lime sludge lagoons. **Creosote** wastewater was contained in these lagoons from approximately 1963 to 1975.
K	1935-1970	Lime sludge lagoon. Temporarily held **creosote** wastewater in 1970 when sites L&M were found to be leaking.
N	1935-1976	Originally a lime sludge spreading area, this became the original spray field for **creosote** wastewater from 1974-1967.
I	1966-1974	Originally used for cooling water. Used for disposal of wastewater containing pentachlorophenol from 1971 to 1974. Although no longer in use, standing water is present.
H	1975-1986	Former spray field for plant wastewater.
R		Interceptor Ditch
X		Waste Pile, moved to **creosote** lagoons in 1980.

*These areas were identified as potential RCRA "units the facility Management Plan.

The Koppers/Galesburg site was announced for inclusion on United States National

Priority List (NPL) in December 1982. The Illinois Environmental Protection Agency (IEPA) accepted lead responsibilitics for conduct of a Remedial Investigation/Feasibility Study (RI/FS), with support from the United States Environmental Protection Agency (U.S. EPA). Negotiations were carried out with Koppers, and Burlington Northern, throughout 1984 and 1985 toward an agreement to allow them the opportunity to voluntarily undertake an appropriate RVFS. On March 19, 1985, Koppers and BN entered into a Consent Decree with the State (Docket Number 83-CH-92). Following Work Plan development, the RI work took place from May, 1985, through April, 1986. The final report documenting the findings of the RI was issued on August 8, 1986. A public meeting was held in April, 1987, to discuss this information. Additional field work has been conducted since that time to further characterize the site, which should also decrease the forthcoming remedial design period. Supplemental data on groundwater, surface water and sediment contamination off-site has been provided by the RI conducted by IEPA for the adjacent Steagall Landfill.

The public comment FS findings were released on May 22, 1989, as was the Agency's proposed plan. A public comment period was initiated that day and concluded on June 12, 1989. A Special Notice Letter and draft RD/RA Consent Decree will be sent to Koppers and Burlington Northern in early July, 1989, beginning the moratorium period on Remedial Design/Remedial Action (RD/RA) settlement discussions. Formal negotiation meetings will then take place between Koppers, BN, IEPA, and the Illinois Attorney General's Office (IOAG), with technical support from USEPA.

Moss-American/Kerr-McGee Oil Co., WI

WEST GROUP ABSTRACT:

REPORT NUMBER: N/A
REGION: 05
DATE: September 27, 1990
SITE: Moss-American/Kerr-McGee Oil Co., WI
LOCATION: Milwaukee County
MEDIA: soil, groundwater, sediment
CONTAM: creosote, PAHs, benzene, toluene, xylene, arsenic, cadmium, lead, zinc
COST: Capital = $25,000,000; O&M = $130,000; Present Worth = $26,000,000

DECLARATION for the RECORD OF DECISION

Moss-American Site, Milwaukee, Wisconsin

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Moss American Site, in Milwaukee County, Wisconsin, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for this Site.

The Wisconsin Department of Natural Resources concurs with the selected remedy. The information supporting this remedial action decision is contained in the administrative record for this Site.

Assessment of the Site

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The selected remedy will be the final remedy at the Site and addresses three contaminated media, on-site soil, on-site groundwater, and sediment of the Little

Menomonee River. The selected remedy uses treatment to address the principal threats to human health and the environment posed by conditions at the Site. The remedy combines source removal and treatment with containment and short-term site access restrictions, thus reducing the threats significantly.

The major components of the selected remedy include the following:

- Removal and treatment of 5,200 cubic yards of contaminated sediment and 80,000 cubic yards of soil by on-site bioremediation, covering remaining soil andtreatment residue for a total of 210,000 cubic yards, on-site.
- Rerouting river parallel to existing channel, filling in and covering existing channel.
- Collecting and treating contaminated groundwater.
- On-site disposal of residue from treatment of Northeast Landfill soil in RCRA compliant unit within the area of contamination.

Specifically,the river will be rechanneled; highly contaminated on-site soil and sediment from the old river channel will be excavated and treated by soil-washing and slurry bio-reactor to health based risk levels of 1×10^{-4} or less. The treatment residue and low level remaining contamination will be covered on-site; the old river channel will be covered with soil from the new channel. Extracted groundwater will be treated by oil/water separator and activated carbon.

Long-Term Management:

The selected remedy provides for continuing monitoring of the groundwater for at least 5-10 years after the remedial action is complete. It is anticipated that source removal will reduce groundwater contamination to acceptable limits within five years. However, ground-water quality will be evaluated in increments of 5 years to determine if the remedial action objectives have been met.

The selected remedy also provides for fencing around the landfill area, and groundwater monitoring between the old and the new river channels.

Declaration of Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action and is cost-effective. A waiver is justified pursuant to Section 121(d)(4)(B) for the Subtitle C cap and for the State double-liner/ leachate collection system requirement, on the basis that an impermeable cap and liner that prevents flushing of groundwater contaminants will present a greater risk to health and the environment by prolonging the groundwater treatment to greater than 200 years. The selected remedy will comply with the Land Disposal Requirements (LDRs) through a Treatability Variance for the contaminated soil and debris.

This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and it satisfies the statutory preference for remedies that employ treatment that reduce toxicity, mobility, or volume as their principal element.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Valdas V. Adamkus
Regional Administrator
DATE 9/27/90

RECORD OF DECISION TEXT

1. Site Description

The eighty-eight acre Moss-American Site includes the former location of the Moss-American creosoting facility, five miles of the Little Menomonee River, a portion of which flows through the eastern half of the site, and the adjacent flood plain soils. The Site is located in the northwestern section of the City of Milwaukee, County of Milwaukee, State of Wisconsin, at the southeast corner of the intersection of Brown Deer and Granville roads, at 8716 Granville Road. See Figure 1 for a location map of the Site. Sixty-five acres of the Site are undeveloped Milwaukee County park land. Twenty-three acres are owned by the Chicago and Northwestern Railroad and used as an automobile loading and storage area. Figure 2 shows current Site use.

Figure 1. Location Map

Figure 2. Existing Conditions

The Little Menomonee River, portions of which are defined as part of the Site, flows through the northeastern portion of the Site, continuing on through the Milwaukee County Parkway, to the confluence of the Menomonee River about five miles to the south. The Little Menomonee River is included in the Milwaukee Estuary and the Menomonee River

Remedial Action Plans (RAP) by virtue of its inclusion in the Menomonee River watershed. The river is classified INT-D, which means that it is considered suitable for intermediate (tolerant) fish and aquatic life. The Site is located in a moderately populated suburban area of mixed industrial, commercial, residential, and recreational use. South Eastern Wisconsin Regional Planning Commission (SEWRPC) estimates the population at 2,036 persons per square mile. The nature of current Site and area uses is not expected to change in the near future.

The Milwaukee County Soil Survey classifies the developed areas on the Site west of the river as loamy land, land consisting of fill or cut and borrow areas. The wooded areas on both sides of the river consist of a poorly drained silty soil underlain by stratified lacustrine silt and very fine sand. The soil is moderately permeable with high available water capacity. Approximately onequarter of the Site is in the 100-year flood plain as shown in Figure 3.

Figure 3. 100-Year Plain

The Site overlies a surficial, low yield, Class II aquifer above a confining bed of dense silty clay till. The confining bed is a minimum of 40 feet thick and could be as thick as 120 feet. Below the confining bed lies the regional dolomite aquifer. The saturated thickness above the till is between 5 and 15 feet. Groundwater flows at a rate of seven feet per year from west to east, discharging into the river at an average rate of 8,500 gallons per day. Depth to groundwater varies from zero feet in the wetlands near the river, to about 12 feet further west on the Site. The groundwater is not currently used as a source of drinking water; local residents are connected to a municipal system.

Elevations at the Site range from 714 to 750 feet. The river drains the entire Site, running adjacent to the facility for about 2,100 feet. Typical base flow water depth of the Little Menomonee River is 1 to 2 feet, with a corresponding width of about 20 feet. Flow rate is estimated at an average annual of 10 - 17 cubic feet per second, with a peak rate of 330 - 770 cubic feet per second. The sediment is typically silt or clay in composition, soft in some areas and hard packed in others.

2. Site History and Enforcement Activities

In 1921, the T. J. Moss Tie Company established a wood preserving facility on twenty-three acres of the Site west of the Little Menomonee River. The plant preserved railroad ties, poles, and fence posts with **creosote**, a mixture of 200 or more chemical compounds derived from coal tar and fuel oil. The process used a 50/50 mixture of **creosote** and No. 6 fuel oil. There is no indication that any other chemicals were used at the facility. Kerr-McGee purchased the facility in 1963 and changed the facility's name to Moss-American. The name was changed again in 1974 to KerrMcGee Chemical Corporation--Forest Products Division.

From 1921 to 1971, the facility discharged wastes to settling ponds that ultimately discharged to the Little Menomonee River. These discharges ceased in 1971 when, in response to a City of Milwaukee order, Moss-American diverted its process water discharge to the Milwaukee sanitary sewerage system. The facility closed in 1976. The eastern part of the property was acquired by Milwaukee County in 1978; Chicago and North Western Railroad bought the western parcel in 1980. Figure 4 shows historical Site uses.

Figure 4. Historical Land Use

State and national attention came to the Site in 1971 when young people, engaged in an Earth Day clean up of the river, received chemical burns from a tarry substance while wading more than three miles down river from the Site. Sampling results indicated that the tarry substance was **creosote** and that the Moss-American facility was the source of the contamination.

Subsequently, under a Wisconsin Department of Natural Resources (WDNR) order, Kerr-McGee cleaned the eight settling ponds and dredged about 1,700 feet of river to remove **creosote**-contaminated soil and sediment. The settling ponds were filled with clean soil, the discharge pipe to the Little Menomonee River was removed and a twelve foot deep underground clay retaining wall constructed between the ponds and the river, adjacent to the facility.

In 1973, United States Environmental Protection Agency (U. S. EPA) financed the dredging of approximately 5,000 feet of river between the Site and Bradley Road. As Figure 4 shows, most of the dredged sediment were contained on Site in the Northeast Landfill area and along the west bank of the river.

In 1974, U. S. EPA (under the Clean Water Act) and Milwaukee County filed a complaint seeking an injunction against Kerr-McGee Chemical Corporation, and to recover costs incurred for studies and cleanup. In 1978, the lawsuit was dismissed due to the discovery that some of the data had been falsified. Milwaukee County reached a settlement with Kerr-McGee in which it received a major portion of the property. This property was added to the existing county park corridor along the Little Menomonee River south of the Site.

Between 1977 and 1978, the Southeast District of the Wisconsin Department of Natural Resources (WDNR) regulated the disposal of demolition waste from the facility as it was dismantled by the company. This resulted in the removal and off-Site disposal of 450 cubic yards of **creosote**-contaminated soil.

The water quality and soil/sediment contamination studies done by U.S. EPA and other agencies between 1970 and 1980 indicated that gross **creosote** contamination was present in the soil and groundwater at the facility as well as in the sediment of the Little Menomonee River. In 1983, the facility was placed on the National Priorities List (NPL) pursuant to Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. Section 5605 with a Hazard Ranking Score (HRS) of 32.14.

In April of 1985, notice letters were mailed to the potentially responsible parties

(PRPs) which included Kerr-McGee, Chicago and Northwestern Railroad, and Milwaukee County, inviting them to negotiate for the conduct of the Remedial Investigation/Feasibility Study (RI/FS) at the Moss-American Site. All three PRPs attended the meeting held 8/22/85 but declined to undertake the FI/FS. Under an existing remedial contract, U. S. EPA assigned the consulting firm of CH2M Hill the RI/FS project, which began in 1987. The RI report was completed in December 1988 and the FS approved in May 1990.

Popile, Inc. Site, AR

WEST GROUP ABSTRACT

REPORT NUMBER: n/a
REGION: 06
DATE: February 1, 1993
SITE: Popile, Inc. Site, AR
LOCATION: Union County
MEDIA: ground water, soils
CONTAM: NAPLs, DNAPLs, PCB, creosote, VOCs, PAHs
COST: Capital - $12,700,000; O&M - $178,000 present worth - $17,700,000

RECORD OF DECISION

CONCURRENCE DOCUMENTATION FOR THE POPILE SUPERFUND SITE

Site Remedial Project Manager

Office of Regional Counsel
Site Attorney

Stephen Gilrein, Chief
ALNM Section 6H-SA

Carl Edlund, Chief
Superfund Programs Branch 6H-S

George Alexander, Jr.
Regional Counsel 6C

for Allyn M. Davis
Hazardous Waste Management
Division 6H

DECLARATION FOR THE RECORD OF DECISION

POPILE, INC. SITE
EL DORADO, ARKANSAS
Statutory Preference for Treatment as a Principal Element is Met

SITE NAME AND LOCATION

Popile, Inc.
El Dorado, Arkansas

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Popile, Inc. site in El Dorado, Arkansas, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 U.S.C. § 9601 et seq. and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300.

This decision is based upon the contents of the administrative record file for the Popile, Inc. site.

The United States Environmental Protection Agency (EPA) has consulted the Arkansas Department of Pollution Control and Ecology (ADPC&E) on the selected remedy.

Both EPA and ADPC&E are in favor of a remedy that could provide a permanent solution to the hazardous substances, pollutants and contaminants at the Popile, Inc. site. After consultations, ADPC&E and EPA concluded that although incineration (Alternative 5) could most effectively destroy the hazardous substances, pollutants and contaminants at the Popile site, other remedial alternatives, in conjunction with ground water extraction and treatment (Alternative C), could provide a protective remedy.

In a letter to EPA dated August 25, 1992, ADPC&E submitted comments on the proposed plan for the Popile site and suggested biological treatment as a potential remedy for dealing with all the contaminated material at the site. Although EPA originally eliminated biological treatment from the detailed analysis of alternatives, EPA reconsidered biological treatment in addition to other treatment alternatives during an extension to the public comment period. After review of all public comments and considering the relative success of the bioremediation technology at similar wood treater sites, EPA has chosen biological treatment (Alternative 6), in conjunction with ground water extraction and treatment (Alternative C), as the selected remedy. Additional design data will be collected combined with site specific bioremediation treatability studies to verify that remediation goals can be attained. If remediation goals cannot be attained, a "no migration" waiver may be required, if appropriate.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This final remedy addresses remediation of the shallow ground water and contaminated soils at the Popile, Inc. site. The principal threats posed by the site will be eliminated or reduced through treatment and engineering controls.

The major components of the selected remedy include:

Ground water

- Extraction of shallow contaminated ground water and wood treating fluids via interceptor trenches and/or pumping wells;

- Treatment and discharge of the contaminated waters on site, either to a surface water system or reinjection into the aquifer;

- In situ bioremediation of the deep subsurface soils via above ground bioreactor, nutrients and/or oxygen enhancement system and reinjection and/or infiltration galleries; and

- Offsite incineration of recovered wood treating fluids/carrier oils, such as non-aqueous phase liquids (NAPLS) and dense non-aqueous phase liquids (DNAPLS), which have been determined to be a principal threat and continual source of ground water and subsurface soil contamination.

Soils

- Excavation and onsite biological treatment of contaminated soils and sludges in a land treatment unit;

- Grading of excavated/backfilled areas, followed by a vegetative cover;
- Construction/repair of the security fence, installation of warning signs; and
- Conducting environmental monitoring to ensure the effectiveness of the remedy.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and state requirements that are legally applicable or relevant and appropriate to the remedial action and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances being treated onsite for an estimated fifteen to twenty years, the required five-year review of the remedial action will be conducted.

Joe D. Winkle
Acting Regional Administrator
U.S. EPA - Region 6
DATE 2-1-93

DECISION SUMMARY
POPILE, INC. SITE
RECORD OF DECISION

RECORD OF DECISION TEXT

I. LOCATION AND GENERAL DESCRIPTION

The Popile, Inc., site is an inactive wood preserving operation that utilized **creosote**, pentachlorophenol (PCP), and petroleum distillates in its processes. Those compounds constitute hazardous substances as defined at CERCLA Section 101(14), 42 U.S.C. § 9601(14), and further defined at 40 CFR § 302.4. Product and waste handling practices resulted in contamination by these materials to surface and subsurface soils, ground water, surface water, and sediments. The site is located on South West Avenue, approximately 1/4 mile south of the intersection of South West Avenue and U.S. Highway 82 near El Dorado, Union County, Arkansas (Figure 1). The property comprises about 41 acres, bordered on the west by South West Avenue, the Ouachita Railroad on the east, and Bayou de Loutre, on the north. These three boundaries intersect on the north end of the site. A forested highland area borders the site on the south. The site is approximately 3/4 mile south of the El Dorado city limits, which has a population of approximately 25,000. The surrounding area is rural and residential/commercial, although no homes are located along the site perimeter.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

El Dorado **Creosote**, Co., the predecessor company of Popile, Inc., began using the site as a wood treatment facility in 1947. El Dorado Pole and Piling Company, Inc., purchased the property in 1958. Starting in 1976, three surface pits were used as part of the waste treatment process at the plant.

The primary contaminants found at the site include PCP and **creosote** compounds associated with wood treatment, which are compounds that constitute hazardous substances as defined at CERCLA Section 101(14), 42 U.S.C. § 9601(14), and further defined at 40 CFR § 302.4. Wood treatment operations stopped in July, 1982. In September that year, Popile, Inc. was formed and purchased about 7.5 acres of the property, including the pits, and El Ark Industries, Inc., purchased the remaining 34 acres. In 1984, Popile consolidated the three pits into one unit, and El Dorado Pole and Piling ceased to exist. Closure activities for the three surface impoundments were administered by ADPCE in October 1984. Following consolidation of the impoundments, inspections by ADPCE documented surface contamination and the possibility of ground water contamination at the site due to leakage from the unit. In April 1988, ADPCE requested EPA initiate a federal enforcement action against Popile pursuant to the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6901 et seq. In 1988 and 1989, an EPA Field Investigation Team conducted inspections and sampling at the Popile site. The results of these investigations revealed contaminated soils, sludges and ground water at the site. In June 1989, EPA initiated a RCRA enforcement action against Popile, Inc. and its operators, alleging violations relating to the closure and post-closure requirements for the three surface impoundments. EPA has recently settled, in principal, this enforcement matter with Popile, Inc.

Figure 1. Location Map

In August, 1990, EPA determined that actual or threatened releases of hazardous substances from the closure area owned by Popile and the surrounding property that El Ark owned posed an imminent and substantial endangerment to the public health and environment. Based on this determination, EPA conducted an emergency removal action pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, after Popile, Inc. and El Ark, Inc., declined to perform the action themselves. The removal action, conducted from September, 1990, until August, 1991, included grading and shaping the site surface for erosion control, construction of a temporary impoundment area, placing steel culverts in the drainage area, placing topsoil and seed over the entire site and construction of a security fence (Figure 2). More than 66,000 cubic yards of contaminated soil, solidified with a mixture of fly ash and rice hulls to enhance handling properties, were placed in the temporary holding cell on the site. EPA proposed the site for inclusion on the National Priorities List (NPL) in February, 1992. The Remedial Investigation and Feasibility Study (RI/FS), which was conducted by the Alternative Remedial Contracts Strategy (ARCS) contractor, Camp, Dresser and Mckee Federal Programs, began in January, 1992 and was completed in July, 1992.

American Creosote Works, LA

WEST GROUP ABSTRACT
REPORT NUMBER: N/A REGION: 06 DATE: April 28, 1993 SITE: American Creosote Works, LA LOCATION: Winn Parish MEDIA: groundwater, sediments, soils, surface water CONTAM: benzene, creosote, dioxins, DNAPLs, ethylbenzene, metals, PAHs, pentachlorophenol (PCP), phenols, sludges, tar, toluene, VOCs, xylenes COST: capital: $31,000,000; O&M: $750,000; present worth: $46,000,000

DECLARATION FOR THE RECORD OF DECISION

AMERICAN CREOSOTE WORKS INC. SITE

SITE NAME AND LOCATION

American **Creosote** Works, Inc. Site
Winnfield, Louisiana

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the American **Creosote** Works, Inc., in Winnfield, Louisiana, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for this site.

The United States Environmental Protection Agency (EPA), Region 6, has consulted the Louisiana Department of Environmental Quality (LDEQ) on the proposed remedy, and LDEQ has written confirming agreement with the proposed remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This Record of Decision (ROD) addresses the source of hazardous substances, as defined at Section 101(14) of CERCLA, 42 U.S.C. § 9601(14) and further defined at 40 CFR § 302.4, which includes surface sludges. subsurface pooled **creosote** and pentachlorophenol liquids defined as nonaqueous phased liquids (NAPLs), and contaminated soil and debris. This is the final remedy and addresses remediation of the source of shallow ground water contamination and contaminated soils at the American **Creosote** Works, Inc. site. The principal threats posed by the site will be eliminated through treatment.

This ROD addresses the principal threat at the site by thermal destruction (incineration) of the contaminated sludges and in-situ bioremediation of contaminated soils, thereby eliminating the potential for contaminant migration to surface waters and ground waters. The principal threat at the American **Creosote** Works, Inc., site is posed by NAPLs and contaminated soils which are contaminating the shallow ground water. Additional threats are from direct contact with **creosote** and pentachlorophenol sludges and soils at the surface of the American **Creosote** Works, Inc., site. The remedial objectives are to minimize potential exposure by direct contact and to reduce the potential for migration of contaminants into the surface waters and ground waters.
The major components of the selected remedy include:

(1) Pump, separate and treat liquid contaminants. Light nonaqueous phased liquids (LNAPLs) and dense nonaqueous phased liquids (DNAPLs) would be pumped from the zones of pooled product beneath the site, separated from the water, and destroyed by on- or off- site incineration.

(2) On-site incineration of 25.000 cubic yards of highly contaminated tars and sludges. 25,000 cubic yards of tars and sludges located in the “sludge overflow area” of the site, which is the most highly contaminated material, would be excavated and thermally treated on-site. The incinerator ash would be landfilled on-site.

(3) In-situ biological treatment of 250,000 cubic yards of contaminated soils. The remainder of the site’s contaminated soils/sludges from process arm and buried pits would be addressed in-situ by injecting, via wells, nutrients, microbes and oxygen as is necessary to attain stated treatment goals. The ground water extraction system used for NAPL recovery would also be used to hydraulically control any off-site migration of ground water contamination and allow for potential recirculation of the bacteria for efficient treatment.

Because of the expected pace of remediation, the EPA would categorize this site remediation as a Long Term Remedial Action. What this means is that the implementation of this alternative is expected to take several years. The EPA will be responsible for 90% funding beyond the customary 1 year time associated with the operational and functional period of the completed remedy. 90% funding will continue until such time as the established remediation goals are met. The State of Louisiana will be responsible for 10% of the costs. This component is innovative and is expected to provide permanent treatment.

(4) Capping of surface contaminated soils, decontamination and on-site landfilling of process equipment and scrap. Grading and capping would be done to complement the above remedial actions.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining on site for potentially several decades, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of public health, welfare, and the environment.

Joe D. Winkle
Acting Regional Administrator
U.S. EPA - Region 6
Date 04/28/93

RECORD OF DECISION CONCURRENCE DOCUMENTATION FOR THE AMERICAN CREOSOTE WORKS, INC. SUPERFUND SITE WINNFIELD, LOUISIANA

Robert M. Griswold, P.E.
Site Remedial Project Manager
Date 3/31/93

John Dugdale
Office of Regional Counsel
Site Attorney
Date 3/31/93

Stephen Gilrein, Chief
ALNM Section 6H-SA
Date 4/19/93

Carl Edlund, Chief
Superfund Programs Branch 6H-S

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Office of Regional Counsel
Hazardous Waste Branch 6C-W

George Alexander, Jr.
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Allyn M. Davis
Hazardous Waste Management
Division 6H

AMERICAN CREOSOTE WORKS, INC.
SUPERFUND SITE
DECISION SUMMARY

RECORD OF DECISION TEXT

1.0 SITE LOCATION AND DESCRIPTION

The American **Creosote** Works Inc., site, hereinafter referred to as American **Creosote** , is located in the southern portion of the City of Winnfield, in Winn Parish, Louisiana (See Figure 1). The property consists of approximately 34 acres east of Front Street and north of Watts and Grove Streets as depicted in Figure 2. The facility is bounded on two sides by **Creosote** Branch, a perennial creek which flows in a 10-12 foot deep valley. Surface drainage is predominantly via three man-made ditches and a single natural drainage pathway which flow into **Creosote** Branch. East of the former facility is a denuded area containing a mat of tar-like material, and further east is a densely vegetated area surrounding the City's sewage treatment plant.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 2.1 SITE OPERATIONS HISTORY

The facility was used for treating timber with **creosote** and pentachlorophenol (PCP) for over 80 years. Both **creosote** and PCP have been identified as hazardous substances as defined at Section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9601(14) and further defined at 40 Code of Federal Regulations (CFR) § 302.4. The American **Creosote** site began operations in 1901 under the direction of the Bodcaw Lumber Company. This firm owned 61 acres of land in the area of the site. In 1910, Bodcaw Lumber sold 22 acres of the property to the Louisiana Creosoting Company. Records of site operations for the period of ownership by either of these two companies are unavailable. In 1938, American **Creosote** Works of Louisiana, Inc., purchased the property from Louisiana Creosoting. American **Creosote** Works ran the facility from 1938 until 1977, during which time it acquired an additional 12 acres of adjoining property. In 1977, the facility was purchased by the Dickson Lumber Company which was later declared bankrupt and seized by the City of Winnfield for taxes. The property was then purchased by Stallworth Timber Company in 1980.

Figure 1. Site Location Map

Figure 2. POST-REMOVAL SITE MAP

Aerial photographs were utilized to interpret site conditions over the operational history, as reported below and shown on Figure 3. Aerial photographs provide evidence that the facility was well established by 1940. An office building was present west of **Creosote** Branch along Front Street and just south of the main entrance. Wood-treating operations were concentrated in the north-central portion of the site (the process area). The process area consisted of a boiler building flanked by pressure chambers, or retorts. A tank farm consisting of several vertical tanks lacking secondary containment was present immediately east of the boiler building. The southern half of the property was used primarily for debarking, cutting, and staging timbers prior to treatment.

Several sets of railroad tracks, used to transport treated and untreated lumber around the facility, ran from the southwest corner of the site north and northeast through the process area to the northeast portion of the site. The railroad tracks crossed **Creosote** Branch on three trestles north of the process area. Stacks of untreated lumber were present during plant operations in the southwest and western portions of the site. Stacks of treated lumber were evident in the central and north-central (north of **Creosote** Branch) portions of the site. In the 1940 photographs an unnamed drainage pathway in the northeast portion of the site follows a meandering path from the process area north and east (through an area later referred to as the "tar mat") to a confluence with **Creosote** Branch.

Between late 1950 and mid 1952, two impoundments were constructed east of the process area (Impoundments 1 and 2 on Figure 3). These impoundments probably received liquid wastes from the wood treating process including water, tree sap, **creosote**, petroleum distillates, and PCP. A third impoundment was constructed east of a new retort in the early to mid 1969s (Impoundment 3 on Figure 3). Based on the aerial photographs, the mid- to late- 1960's appear to be the period of maximum activity or production at the American **Creosote** site. Records discovered in a shed on site provide information regarding the magnitude of the American **Creosote** operation during that time. According to these records, for a seven-month period ending July 31, 1966, more than 750,000 gallons of petroleum distillate, 40,000 gallons of **creosote**, and 54,000 pounds of PCP were used to treat approximately 7.5 million board-feet of wood.

Figure 3. PRE-REMOVAL SITE MAP .

Impoundment 1 was apparently backfilled with soil and wood chips between 1967 and 1970. Apparent in the 1973 photographs is the development of the tar mat area, perhaps resulting from a single spill event. Located approximately 500 feet east of the process area, the tar mat is a large, flat, asphalt-like layer which extends over a marshy portion of the site. A number of mature pine trees located within the tar mat appear to have died shortly before the 1973 photographs were taken. Between 1973 and 1976, extensive earth moving operations north and east of the process area covered up most of the darkly stained soils and obliterated the remains of Impoundment 1. Impoundment 4 (Figure 3) was built immediately north of Impoundment 2 and may have been used to contain drainage from Impoundment 2. A pond was constructed just south of Impoundment 2 to collect and store water for emergency fire fighting purposes. Based on the volume of treated and untreated wood present onsite, wood treating operations may have been declining during this period.

By 1979, wood treating operations at the American **Creosote** site appear to have ceased. No untreated wood and very little treated wood are present in aerial photographs taken at that time. All railroad tracks had been removed from the site. This roughly coincides with the time at which the site owner. Dickson Lumber Company, was declared bankrupt and seized by the City of Winnfield. Aerial photographs taken in 1981, shortly after the site was purchased by Stallworth Timber Company, provide evidence of the resumption of wood treating activities at the site. A large drainage ditch was excavated from the south-central portion of the site north and east between the process area and

Impoundment 2.

Judging from the quantity of treated and untreated wood stockpiled onsite, operations were taking place on a much smaller scale after 1980, than during the period of ownership by American **Creosote** Works, Inc. By 1983, Impoundments 2 and 4 had been backfilled, presumably with wood chips and soil, and the impoundment retaining walls had been demolished. Impoundment 3 was apparently still active. Evidence of continuing wood treating operations is present in photographs taken in 1983 and 1984.

In summary, the facility was used for over 80 years as a wood treating operation that utilized **creosote** and PCP in the treatment process. The facility also incorporated petroleum products as a carrier fluid for the **creosote** and/or PCP. Based on a review of available records and site sampling activities there is no reason to believe this facility used inorganic compounds (i.e., chromated copper arsenate, ammoniacal copper arsenate, etc.) in the treatment process.

2.2.2.2 ENFORCEMENT ACTIVITIES

The Louisiana Department of Environmental Quality (LDEQ) issued a letter of warning to Stallworth Timber Company in January 1983, in response to releases of contaminants to the environment. In December 1984, LDEQ found no environmental improvements and issued a Compliance Order the next month. In June 1985, LDEQ inspectors found the site abandoned. In March 1987, LDEQ referred the matter to the Environmental Protection Agency (EPA) Region 6, requesting it to take action. Under EPA's direction, several investigations of the site were conducted in 1987 and 1988. In 1989, the EPA Emergency Response Branch conducted a removal action pursuant to Section 106 CERCLA, 42 U.S.C. § 9606, having determined that actual or threatened releases of hazardous substances from the site posed an imminent and substantial endangerment to the human health or the environment. This response action at the American **Creosote** site included source control and contaminant migration control actions. At the time the site was found abandoned, it consisted of 15 tanks, four pressure vessels or retorts, a boiler building, a tool and die shop, offices and other administrative buildings, and several unlined waste impoundments.

In December 1991, representatives of EPA, the United States Department of Justice, and the Stallworth Timber Company met. The purpose of the meeting was to discuss reimbursement to the United States Government for past response costs incurred and future costs to be incurred at the site by the United States. During the course of this meeting the United States learned that the Stallworth Timber Company had sold the property in 1990 to Reinhardt Investments located in the Netherlands Antilles. In addition, during this meeting the Stallworth Timber Company was provided the opportunity to conduct the Remedial Investigation (RI) and future activities (i.e., Feasibility Study (FS), Remedial Design (RD), Remedial Action (RA)) associated with the site. The Stallworth Timber Company indicated in the meeting and subsequently by letter dated December 12, 1992, its reluctance to conduct this work due to financial inability. Further inquires to Reinhardt Investments have provided no response.

2.3.2.3 RESPONSE ACTION

The results from EPA's investigative efforts provided evidence that the site posed a significant human health and environmental threat. In May 1988, the EPA issued an Administrative Order to Stallworth Timber Company to fence and post warning signs around the most contaminated portions of the site. In July 1988, the fencing of the site was completed by Stallworth Timber Company. During oversight monitoring of this action, an EPA's Emergency Response Cleanup Services (ERCS) contractor noticed that two storage tanks were in imminent danger of rupturing. Stallworth Timber Company was verbally notified by EPA of this threat and declined the opportunity to respond. This prompted immediate mobilization of an ERCS team to drain the tanks and construct a berm around the process area in order to contain and stabilize the heavily contaminated soils. Following this work, heavy rain threatened to overflow and erode the berm. Consequently, ERCS was remobilized to extend the berm height and install an overflow filtration system.

In February 1989, the EPA issued a Unilateral Administrative Order to the Stallworth Timber Company for a removal action to address the immediate threats posed by the site that were found during the previous investigations. Stallworth Timber Company declined to take action, and between March 17 and August 31, 1989, EPA conducted an emergency removal action at the site pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606. The following steps were taken to stabilize the site.

- Fluids from all storage tanks were consolidated into a single tank (approximately 10,000 gallons of **creosote** and PCP treating fluids, 51,000 gallons of contaminated water, and 56,000 gallons of sludge).

- An east-west drainage ditch was constructed to redirect surface water originating from the southern portion of the site away from the heavily contaminated northern portion.

- The largest north-south drainage ditch running through the most contaminated area was backfilled.

- Contaminated water from holding ponds, lagoons, storage tanks, and containment basins was filtered and discharged to **Creosote** Branch.

- Waste wood treating fluids and sludges from storage tanks and contaminant areas were transferred to a former impoundment (Impoundment 3), solidified with fly ash and rice hulls, and capped.

- Building and process equipment were dismantled and an attempt was made to decontaminate the debris. This debris was placed in a scrap pile immediately northwest of the process area.

North Cavalcade Street Site, Houston, Texas

WEST GROUP ABSTRACT:

REPORT NUMBER: N/A
REGION: 06
DATE: Jun 28, 1988
SITE: North Cavalcade Street Site, Houston, Texas
LOCATION: Harris County
MEDIA: groundwater, soil, sediment
CONTAM: PAHs, benzene, toluene, xylenes
COST: capital - $4,210,000; O&M - $0/year

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

North Cavalcade Street site, Houston, Texas

STATEMENT OF PURPOSE

This decision document presents the selected remedial action for the North Cavalcade Street site in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, November 20, 1985.

The State of Texas (through the Texas Water Commission) has been briefed on the methods of technology and degree of treatment stated by the Record of Decision.

STATEMENT OF BASIS

This decision is based upon the administrative record for the North Cavalcade Street site. The attached index identifies the items which comprise the administrative record.

DESCRIPTION OF THE REMEDY

The selected remedy will treat the health-and environment threatening contamination resulting from historical wood preserving operations at the site. Upon review of the information contained in the administrative record, EPA has decided that oil/water separation and carbon absorption of groundwater and biological treatment of contaminated soils best fulfills the statutory selection criteria. The following is a brief summary of the proposed remedy:

Contaminated surficial soils - Treat onsite using biological treatment to a level of 1 ppm. of carcinogenic polynuclear aromatic hydrocarbons. In-place treatment is preferred, but the actual method willbe selected from the results of pilot testing during the Remedial Design.

Contaminated Groundwater - Extract and treat onsite using oil/water separation and carbon absorption until all non-aqueous phase liquids (NAPLs) are completely removed and benzene concentrations do not exceed 5 ug/l; incinerate the NAPLs offsite.

EPA will later decide the optimal means for remediating contamination from polychlorinated biphenyls; in the drainage ditch on the eastern boundary of the site.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy satisfies the preference for treatment that reduces toxicity, mobility or volume as a principal element. Finally, it is determined that this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Robert E. Layton Jr., P.E.
Regional Administrator
Date: June 25, 1988

RECORD OF DECISION TEXT

1. SITE LOCATION AND DESCRIPTION

The North Cavalcade Street site is located in northeast Houston, Texas about one mile southwest of the intersection of Interstate Loop 610 and U.S. Route 59 (Figure 1). The site boundaries are Loop 610 to the north, Cavalcade Street to the south, and the Missouri and Pacific railroad lines to the east and west. The site is triangular in shape with a base of approximately 600 feet, an apex of 3,000 feet, and an area of 21 acres.

Figure 1. Site Location Map

The site is generally flat with several small mounds and depressions. It is drained by three stormwater drainage ditches. Two of these flank the site on the east and west sides, and drainwater to the third ditch which bisects the site into northernand southern sections. The third ditch drains into a flood control ditch which discharges into Hunting Bayou, a tributary of the Houston Ship Channel. Hunting Bayou is currently classified in the Texas water quality standards as a limited aquatic habitat.

The site is now used by two commercial enterprises which have erected two buildings on the southern part of the site. The remainder of the site is not currently used. The surrounding areas are residential, commercial, and industrial properties. The nearest residential area, an old low-income neighborhood, is directly to the west. Commercial properties are located along the major thoroughfares as well as onsite.

2. SITE HISTORY

2.1 2.1 PREVIOUS SITE USE

The North Cavalcade Street site was not developed until Mr. Leon Aron acquired the site in 1946 and established on it a small wood preserving business, Houston Creosoting Company, Inc. (HCCI). The HCCI business initially included **creosote** wood preserving operations. In about 1955, HCCI added pentachlorophenol (PCP) wood preservation services and other support facilities.

In 1961, the East End Bank of Houston foreclosed on the property, and wood preserving operations ceased. In 1964, the bank sold the property to the Monroe Ferrell Concrete Pipe Company. There has been no industrial activity since 1964.

Subsequent property owners divided the site into smaller tracts and sold them to a succession of owners. The property is now owned by two companies and two individuals. The Great Southern Life Insurance Company owns 1.6 acres in the southwest corner of the site and has constructed a building. The Coastal Casting Company owns two tracts consisting of 4.7 acres in the southern area of the site; the company built a building used for engine repair upon the western most tract. These tracts encompass the operations and waste pit areas of the old wood preserving facility. Two other tracts are owned by R. D. Eichenour (3.9 acres) and A. D. Dover (10.0 acres), and represent the remainder of the site. Figure 2 shows the current and historical site features.

Figure 2. Composite of Historical and Current Site Features

2.2 GEOLOGY AND HYDROGEOLOGY

The North Cavalcade Street site is in the southeast Texas Coastal Plain. This region is underlain with Holocene and Pleistocenedeposits to a depth of roughly 2400 feet. The aquifers used to supply water for domestic, industrial and agricultural purposes are the Lower Chicot and Evangeline, both confined aquifers isolated from surface recharge. Public water supply wells are screened in theEvangeline Aquifer at depths greater than 600 feet. Industrial water users have wells screened in both aquifers at depths ranging from 50 to 576 feet.

The site-specific geology of the upper 50 feet is shown in Figure 3. It consists of four distinct layers:

Figure 3. Generalized Soil Profile

Stratum	Depth (ft)	Description
I	0-5	Sandy silt and sandy clay
II	5-12	Soft to very stiff sandy clay and clayey sand
III	12-26	Medium dense to dense fine sand
IV	26-80	Very stiff to hard clay and silty clay with sand and silt layers

The fine sand in Stratum II is the principal water bearing unit at the North Cavalcade Street site. This unit is not currently used as a source of water within Houston because the water yield is low. The potentiometric surface developed during the Remedial Investigation shows that the groundwater flow is toward the west and is recharged by the ditches crossing the site.

2.3 2.3 REMEDIAL INVESTIGATION RESULTS

The U.S. Environmental Protection Agency (USEPA) sampled five different types of environmental media at the North Cavalcade Street site between September 1995 and November 1987. These included air, surface water, sediments, soils, and groundwater. The samples collected during this period were analyzed for toxic substances characteristic of wood preserving sites.

The USEPA found polynuclear aromatic hydrocarbons (PAHs) and volatiles (benzene, toluene, and xylenes) in soils, groundwater, and sediments at levels above those natural to this area on the southern 10 acres of the site. These compounds are components of**creosote**, one of the wood preserving mixtures used at the site. The other wood preserving chemical used at this site, pentachlorophenol, was not found. Inorganic metals were infrequently found at levels above background. Tables 1 and 2 show the maximum concentrations of analyzed compounds in soils and groundwater and their frequency of detection above background levels.

The contamination in soil and the upper groundwater unit describes the way in which historical operations contributed to the contamination. USEPA first found **creosite**-type contaminants in surficial soil in two areas corresponding to the historical operation area and **creosote** lagoon; these areas cover approximately 1 acre. These data show that **creosote** stored in these areas was allowed to seep into the soil and thereby became the source of further contamination. The surficial soil is a sandy clay which allows a pathway for vertical migration. The **creosote** became adsorbed onto the soils until they were saturated. At that point, the **creosote** entered the groundwater in the surface aquifer.

The surface aquifer is a layer of sand which provides a pathway for further migration. As in the surficial soil, the **cresote** became adsorbed onto the sand until the sand was saturated. The **creosote** then encountered a hard clay below the aquifer. Also. the compounds which comprise **creosote** became partially dissolved and weretransported westward with the groundwater flow. The volatile compounds such as benzene are the more soluble; these traveled the farthest. The dissolved contaminants in the groundwater now form a plume covering approximately 4 acres.

As stated above, the**creosote** encountered a layer of hard clay below the surface aquifer and spread along the top of the clay to cover an area of approximately 6 acres. The contamination in this clay layer consists of both soil with adsorbed PAHs and a nonaqueous phase liquid (NAPL) characteristic of denatured **creosote**. The clay layer in general retards further vertical migration. The permeability of this layer is reported in other geological investigations of this area as roughly 10^9 cm/sec.

USEPA also found **creosote**-type contaminants in the sediments of ditches draining the site. The concentrations of PAH compounds in the sediments ranged from undetected to 93 ppm. This contamination probably resulted from rainfall runoff during the time of historical operations or oil spills along the railroad tracks.

In addition, sediment samples in one isolated area near the railroad track on the east side of the site showed contamination from polychlorinated biphenyls (PCBs). PCBs are not used in wood preserving operations. The cause of this contamination appears to be a spill resulting from railroad activity. USEPA has recently gathered data to better define the area, and will address remediation of the PCBs later.

The analyses of air and drainage ditch water showed no measurable contamination.

Attachment 3

Documents to Support the Evaluation of the Proposed Remedy and Alternate Remedies

PB92-963345

United States Environmental Protection Agency | Office of Solid Waste and Emergency Response | Superfund Publication: 9380.3-06FS November 1991

EPA

A Guide to Principal Threat and Low Level Threat Wastes

Office of Emergency and Remedial Response
Hazardous Site Control Division OS-220W

Quick Reference Fact Sheet

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) promulgated on March 8, 1990 states that EPA expects to use "treatment to address the principal threats posed by a site, wherever practicable" and "engineering controls, such as containment, for waste that poses a relatively low long-term threat." (40 CFR Section 300.430(a)(1)(iii).) These expectations, derived from the mandates of CERCLA §121 and based on previous Superfund experience, were developed as guidelines to communicate the types of remedies that the EPA generally anticipates to find appropriate for specific types of wastes. Although remedy selection decisions are ultimately site-specific determinations based on an analysis of remedial alternatives using the nine evaluation criteria, these expectations help to streamline and focus the remedial investigation/feasibility study (RI/FS) on appropriate waste management options. This guide explains considerations that should be taken into account in categorizing waste for which treatment or containment generally will be suitable and provides definitions, examples, and ROD documentation requirements related to waste that constitute a principal or low level threat. EPA makes this categorization of waste as principal or low level threat waste after deciding whether to take remedial action at a site. The "Interim Final Guidance on Preparing Superfund Decision Documents," (EPA/624/1-87/90, October 1990) and "A Guide to Developing Superfund Records of Decision" (Publication 9335.3-02FS-1, May 1990) provide additional information on ROD documentation.

NCP Expectations

EPA established general expectations in the NCP (40 CFR 300.430(a)(1)(iii)) to inform the public of the types of remedies that EPA has found to be appropriate for certain types of waste in the past and anticipates selecting in the future. These expectations (see Highlight 1) provide a means of sharing collected experience to guide the development of cleanup options. They reflect EPA's belief that certain source materials are addressed best through treatment because of technical limitations to the long-term reliability of containment technologies, or the serious consequences of exposure should a release occur. Conversely, these expectations also reflect the fact that other source materials can be safely contained and that treatment for all waste will not be appropriate or necessary to ensure protection of human health and the environment, nor cost effective.

Identifying Principal and Low Level Threat Wastes

The concept of principal threat waste and low level threat waste as developed by EPA in the NCP is to be applied on a site-specific basis when characterizing source material. "Source material" is defined as material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, to surface water, to air, or acts as a source for direct exposure.

HIGHLIGHT 1: NCP Expectations Involving Principal and Low Level Threat Wastes

EPA expects to:

1. Use treatment to address the principal threats posed by a site, wherever practicable.
2. Use engineering controls, such as containment, for wastes that pose a relatively low long-term threat or where treatment is impracticable.
3. Use a combination of methods, as appropriate, to achieve protection of human health and the environment. In appropriate site situations, treatment of principal threats posed by a site, with priority placed on treating waste that is liquid, highly toxic or highly mobile, will be combined with engineering controls (such as containment) and institutional controls, as appropriate, for treatment residuals and untreated waste.
4. Use institutional controls such as water use and deed restrictions to supplement engineering controls as appropriate for short- and long-term management to prevent or limit exposure to hazardous substances.

Examples of principal and low level threat wastes are provided in Highlight 3.

Risk Management Decisions for Principal and Low Level Threat Wastes

The categorization of source material as a principal threat or low level threat waste, and the expectations regarding the use of treatment and containment technologies follows the fundamental decision as to whether any remedial action is required at a site. These determinations, and the application of the expectations, serve as general guidelines and do not dictate the selection of a particular remedial alternative. For example, EPA's experience has demonstrated that highly mobile wastes (e.g., liquids) are difficult to reliably contain and thus generally need to be treated. As such, EPA expects alternatives developed to address highly mobile material to focus on treatment options rather than containment approaches.

However, as stated in the preamble to the NCP (55 FR at 8703, March 8, 1990), there may be situations where wastes identified as constituting a principal threat may be contained rather than treated due to difficulties in treating the wastes. Specific situations that may limit the use of treatment include:

- Treatment technologies are not technically feasible or are not available within a reasonable time frame;
- The extraordinary volume of materials or complexity of the site make implementation of treatment technologies impracticable;
- Implementation of a treatment-based remedy would result in greater overall risk to human health and the environment due to risks posed to workers or the surrounding community during implementation; or
- Severe effects across environmental media resulting from implementation would occur.

Conversely, there may be situations where treatment will be selected for both principal threat wastes and low level threat wastes. For example, once a decision has been made to treat some wastes (e.g., in an onsite incinerator) economies of scale may make it cost effective to treat all materials including low level threat wastes to alleviate or minimize the need for engineering/institutional controls.

While these expectations may guide the development of appropriate alternatives, the fact that a remedy is consistent with the expectations does not constitute sufficient grounds for the selection of that remedial alternative. The selection of an appropriate waste management strategy is determined solely through the remedy selection process outlined in the NCP (i.e., all remedy selection decisions are site-specific and must be based on a comparative analysis of the alternatives using the nine criteria in accordance with the NCP). Independent of the expectations, selected remedies must be protective, ARAR-compliant, cost-effective, and use permanent solutions or treatment to the maximum extent practicable. Once the final remedy is selected, consistency with the NCP expectations should be discussed as part of the documented rationale for the decision.

ROD Documentation

Declaration

The "Description of the Selected Remedy" section should note whether the remedy is addressing any source materials that constitute "principal" or "low level" threat wastes, or both.

The "Statutory Determinations" section should discuss how the selected remedy satisfies the statutory preference stated in CERCLA §121 to select remedial actions "in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants, and contaminants is a principal element." In evaluating this statutory preference, the site manager needs to decide whether treatment selected in the ROD constitutes treatment as a major component of the remedy for that site. Remedies which involve treatment of principal threat wastes likely will satisfy the statutory preference for treatment as a principal element, although this will not necessarily be true in all cases (e.g., when principal threat wastes that are treated represent only a small fraction of the wastes managed through containment). Ground water treatment remedies also may satisfy the statutory preference, even though contaminated ground water is not considered a principal threat waste and even though principal threat source material may not be treated.

Decision Summary

The "Decision Summary" of the ROD should identify those source materials that have been identified as principal threat and/or low level threat wastes, and the basis for these designations. These designations should be provided in the "Summary of Site Characteristics" section as part of the discussion focusing on these source materials that pose or potentially pose a risk to human health and the environment. In addition, the "Description of Alternatives" and the "Selection of Remedy" sections should briefly note how principal and/or low level threat wastes that may have been identified are being managed.

The "Statutory Determinations" section of the ROD should include a discussion of how the statutory preference for treatment as a principal element is satisfied or explain why it is not satisfied, stating reasons in terms of the nine evaluation criteria.

Contaminated ground water generally is not considered to be a source material although non-aqueous phase liquids (NAPLs) may be viewed as source materials. The NCP establishes a different expectation for remediating contaminated ground water (i.e., to return usable ground waters to their beneficial uses in a time frame that is reasonable given the particular circumstances of the site). Examples of source and non-source materials are provided in Highlight 2.

HIGHLIGHT 2: Examples of Source and Non-Source Materials

Source Materials

- Drummed wastes
- Contaminated soil and debris
- "Pools" of dense non-aqueous phase liquids (NAPLs) submerged beneath ground water or in fractured bedrock
- NAPLs floating on ground water
- Contaminated sediments and sludges

Non-Source Materials

- Ground water
- Surface water
- Residuals resulting from treatment of site materials

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. They include liquids and other highly mobile materials (e.g., solvents) or materials having high concentrations of toxic compounds. No "threshold level" of toxicity/risk has been established to equate to "principal threat." However, where toxicity and mobility of source material combine to pose a potential risk of 10^{-3} or greater, generally treatment alternatives should be evaluated.

Low level threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of release. They include source materials that exhibit low toxicity, low mobility in the environment, or are near health-based levels.

Determinations as to whether a source material is a principal or low level threat waste should be based on the inherent toxicity as well as a consideration of the physical state of the material (e.g., liquid), the potential mobility of the wastes in the particular environmental setting, and the lability and degradation products of the material. However, this concept of principal and low level threat waste should not necessarily be equated with the risks posed by site contaminants via various exposure pathways. Although the characterization of some material as principal or low level threats takes into account toxicity (and is thus related to degree of risk posed assuming exposure occurs), characterizing a waste as a principal threat does not mean that the waste poses the primary risk at the site. For example, buried drums leaking solvents into ground water would be considered a principal threat waste, yet the primary risk at the site (assuming little or no direct contact threat) could be ingestion of contaminated ground water, which as discussed above is not considered to be a source material, and thus would not be categorized as a principal threat.

The identification of principal and low level threats is made on a site-specific basis. In some situations site wastes will not be readily classifiable as either a principal or low level threat waste, and thus no general expectations on how best to manage these source materials of moderate toxicity and mobility will necessarily apply. [NOTE: In these situations wastes do not have to be characterized as either one or the other. The principal threat/low level threat waste concept and the NCP expectations were established to help streamline and focus the remedy selection process, not as a mandatory waste classification requirement.]

HIGHLIGHT 3: Examples of Principal and Low Level Threat Wastes

Wastes that generally will be considered to constitute principal threats include, but are not limited to:

- Liquids - waste contained in drums, lagoons or tanks, free product (NAPLs) floating on or under ground water (generally excluding ground water) containing contaminants of concern.
- Mobile source material - surface soil or subsurface soil containing high concentrations of contaminants of concern that are (or potentially are) mobile due to wind entrainment, volatilization (e.g., VOCs), surface runoff, or sub-surface transport.
- Highly-toxic source material - buried drummed non-liquid wastes, buried tanks containing non-liquid wastes, or soils containing significant concentrations of highly toxic materials.

Waste that generally will be considered to constitute low level threat wastes include, but are not limited to:

- Non-mobile contaminated source material of low to moderate toxicity - Surface soil containing contaminants of concern that generally are relatively immobile in air or ground water (i.e., non-liquid, low volatility, low leachability contaminants such as high molecular weight compounds) in the specific environmental setting.
- Low toxicity source material - soil and subsurface soil concentrations not greatly above reference dose levels or that present an excess cancer risk near the acceptable risk range.